# INTERNATIONAL
# PETROLEUM
# ENCYCLOPEDIA
# 1992

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# International Petroleum Encyclopedia

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# INTERNATIONAL PETROLEUM ENCYCLOPEDIA

Next 25 years of petroleum industry likely to mirror turbulence of past 25 ..... 5

NORTH AMERICA
- United States ..... 20
- Gulf of Mexico ..... 52

- Canada ..... 58

CHINA ..... 66

ASIA PACIFIC
- Australia ..... 78
- Brunei ..... 80
- Cambodia ..... 80
- India ..... 81
- Indonesia ..... 82
- Japan ..... 86
- Korea, South ..... 88
- Malaysia ..... 88
- Mongolia ..... 89
- Myanmar ..... 90
- New Zealand ..... 90
- Pakistan ..... 90
- Papua New Guinea ..... 95
- Philippines ..... 96
- Taiwan ..... 96
- Thailand ..... 97
- Viet Nam ..... 99

MIDDLE EAST
- Iran ..... 100
- Iraq ..... 106
- Oman ..... 106
- Qatar ..... 107
- Saudi Arabia ..... 107
- United Arab Emirates ..... 109
- Yemen ..... 111

LATIN AMERICA

Argentina 112
Belize 113
Bolivia 115
Brazil 117
Colombia 119
Cuba 121
Ecuador 122
Mexico 124
Panama 125
Peru 126
Trinidad and Tobago 126
Venezuela 126

AFRICA

Algeria 128
Angola 130
Cameroon 131
Chad 131
Congo 133
Egypt 133
Ethiopia 133
Gabon 134
Ghana 136
Kenya 137
Libya 138
Namibia 138
Niger 139
Nigeria 139
Senegal 141
Tunisia 141
Uganda 142
Zimbabwe 142

U.S.S.R. 144

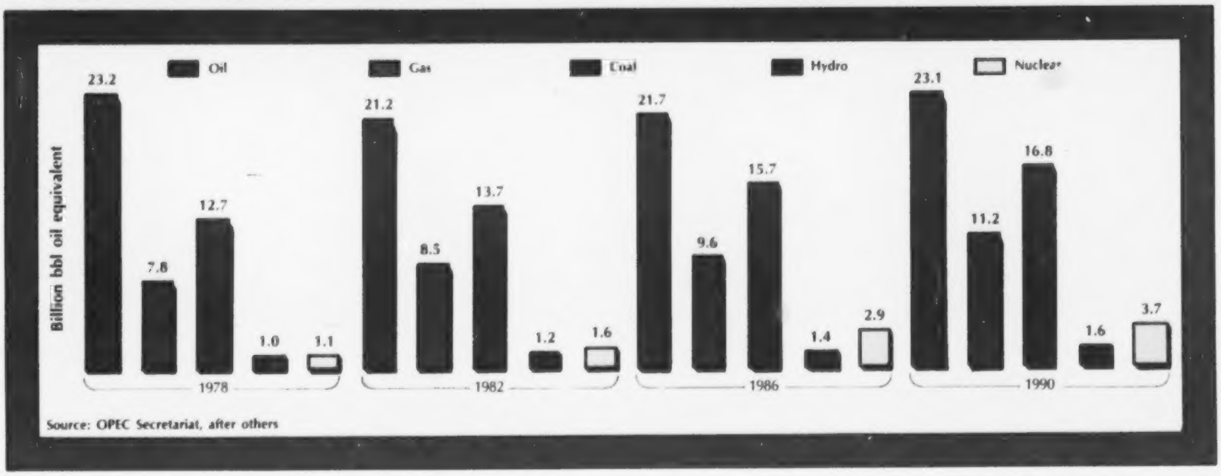
EASTERN EUROPE 158

EUROPE

Austria 164
Belgium 164
Denmark 164
Finland 165
France 165
Germany 165
Greece 167
Ireland 169
Italy 171
Malta 172
Netherlands 172
Norway 172
Portugal 173
Spain 173
Sweden 176
Switzerland 177
United Kingdom 177
North Sea 178

Chronology of events 18
Alaskan oil sector 190
U.S. Clean Air Act 200
U.S. oil spill cleanup 207
East Europe opportunities 211
U.S.S.R. oil ventures 218
Kuwait recovery 222
Arkoma, Anadarko basins 230
Horizontal drilling 236
Tanker industry outlook 242
World LNG trade 247
Texas petroleum history 251
International active rigs 260
International seismic crews 261
E&P spending 262
Stratigraphic charts 264
World reserves, production 270
Production survey 272
Gas production 307
Industry prices 308
Pipelines 310
World oil map 316
Refinery throughput 318
Historical reserves 318
Refining update 319
Refining survey 327
Production statistics 340
Consumption statistics 344
Refining statistics 345
Worldwide Gas Processing 350
Index of contents 351
Advertisers' index 358

## World energy consumption mix



Source: OPEC Secretariat, after others

carbon resources may be. With the stampede of foreign companies over the sprawling carcass of the U.S.S.R., it may be only a few years before oil markets know just how critical a factor that region's oil and gas will be to world markets.

What of the push by developing nations, especially in Latin America and to a lesser extent Africa, to bolster foreign investment in their petroleum sectors as privatization spreads across those regions? What if the free trade push, flourishing in North America, continues to spread south?

What of burgeoning economies of the Far East? Countries such as Thailand and Indonesia project annual energy demand growth rates in double digits. What happens if (when?) Viet Nam, Laos, North Korea, and Cambodia join them?

In the 1970 IPE was this echo of today's headlines:

> *"The Seventies will be a decade of dissent. The unrest and the dissatisfaction with standards of living have already been fed by man's geometric progression in communications. In the developing nations and in the most sophisticated of the industrialized countries, people are exposed to the evidence of the better life enjoyed by others. They are bent on getting more of it, and if governments withhold or deny their aspirations, governments will in time change their policies, or they will fall."*

### The environmental question

If there is one virtually foolproof prediction for the petroleum industry in the coming 25 years it is this: the

**Iraq nationalizes most assets of Iraq Petroleum Co. group of western companies, puts Rumaila field on stream with Soviet help**

**Iran completes expansion of Kharg Island terminal**

**Indonesia's government approves plans for giant refining/petrochemical complex on Batam Island**

**Brunei delivers its first cargo of LNG to Japan**

**Removal of trade barriers spark flurry of tentative joint venture deals by U.S. companies in the U.S.S.R.**

**Cold snap causes oil and gas shortages across much of the U.S.**

**Central America has its first commercial discovery, Tortugas in Guatemala**

**Norway's Statoil, Denmark's DONG founded**

### 1973

**API calls on Washington to shape a national energy policy, warning of growing overreliance on foreign oil imports**

**Spain's first offshore field, Amposta Marino, starts up**

**Mexico becomes a net oil importer, and the government ends a 15 year freeze on domestic refined product prices**

**U.S.S.R. starts up supergiant Fedorovskoye oil field in Siberia**

**Ecuador and Gabon join OPEC**

**Japan negotiates major LNG import deals with Abu Dhabi and Indonesia**

**Iran completes nationalization of IOP western combine**

**OPEC takes over posting of crude oil market prices from multinationals**

**EPA unveils lead phasedown rule**

**World oil tanker tonnage on order hits a record 200 million dwt**

**Plans announced for three major oilsands projects in Alberta**

**Israeli forces damage Syrian oil facilities in October Arab-Israeli war**

**Arab oil embargo led by Kuwait and Saudi Arabia put in place**

**OPEC doubles posted crude marker price to $5.12/bbl and 2 months later increases it to $11.65/bbl**

**President Nixon signs Trans-Alaska Pipeline Authorization Act**

**Prime Minister Trudeau implements new controls and taxes on Canadian oil exports**

**President Nixon sets a U.S. policy goal of energy self-sufficiency by 1980**

### 1974

**U.S. Interior Dept. gets record $210 million bid for oil shale lease in Colorado**

**Canadian companies drill string of discoveries on Mackenzie Delta**

**ENI drills Malossa gas/condensate strike, Italy's biggest, in Po Valley**

**Federal Power Commission orders single U.S. uniform ceiling price of 42¢/Mcf for interstate sales at the wellhead**

**First hydrocarbons discovered in West German sector of the North Sea**

**Japan's MITI approves plans for 16 refineries to expand capacity by 1.6 million b/d to 6.44 million b/d**

**Malaysia's government creates state oil company Petronas**

**India's ONGC discovers Bombay High giant oil field**

**Shell drills first hydrocarbon discovery off South Viet Nam**

**Ethiopian E&D halts with military overthrow of Emperor Haile Selassie**

**Libya completes majority ownership nationalization of foreign assets**

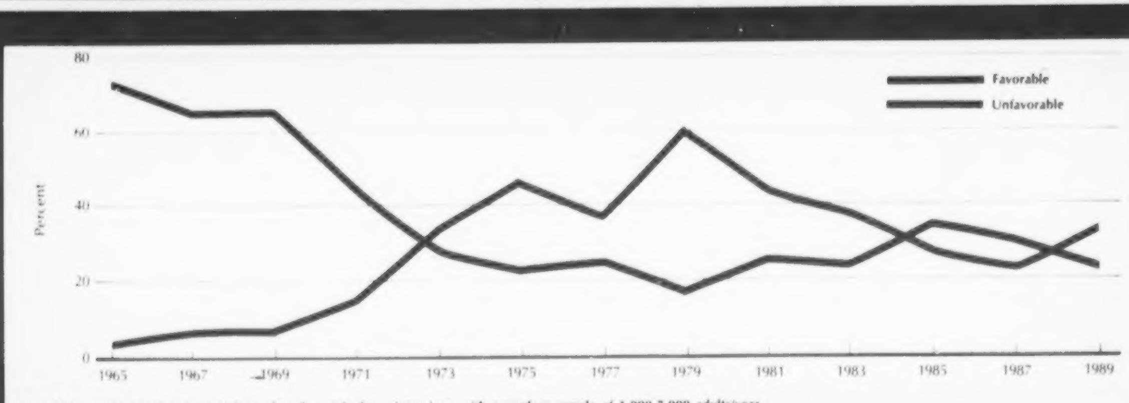
**Nigeria overtakes Libya as No. 1 African producer**

**Brazil drills first offshore Campos basin discovery, Garoupa**

**Colombia halts oil exports**

**Mexico regains oil self-sufficiency with start-up of Chiapas-Tabasco finds**

### Oil and gas industry's image



*Favorability rating of oil and gas industry based on telephone interviews with a random sample of 1,000-7,000 adults/year.
Source: Opinion Research Corp. From: U.S. Petroleum Strategies in the Decade of the Environment by Bob Williams, PennWell Books, 1991

influence of environmentalism will continue to a major, if not the most important concern facing the petroleum industry.

Given the current momentum of environmentalism, the petroleum industry's very survival depends on how well it balances ecological concerns with economic concerns and then conveys a need for that balance to the public. Even $5/bbl oil won't fuel economic growth if its use is severely restricted by direct or indirect prohibitions.

It was oil industry mishaps that gave birth to the modern environmental movement as a political and social force to be reckoned with in 1969, with the Santa Barbara Channel blowout and oil spill, and resurrected that force in 1989, with the Exxon Valdez tanker oil spill.

The oil industry's image took a beating after the 1969 spill, and helped by the price spikes of the 1970s and the 1989 spill, has yet to recover (Fig. 3).

The upshot of that deterioration has been exponential growth in the regulatory oversight of the industry on environmental issues (Fig. 4). The added costs have been staggering and yet are but a fraction of the costs to be paid the next 25 years. It will cost more than $32 billion just to reformulate 80% of the U.S. gasoline pool to the specifications of the 1990 Clean Air Act amendments, according to Ashland Oil Co. Chief Economist Cyrus Tahmassebi. And yet a recent study by the National Research Council suggests that use of reformulated gasoline and alternate fuels may provide little benefit to urban air quality. NRC contends U.S. regulatory programs to control smog the past 20 years may have been misguided.

---

U.S.S.R. logs 596,000 b/d oil production increase, biggest annual increase

Canada's government announces plan to phase out crude oil exports to U.S.

Average price of U.S. crude, two-thirds under price controls, is $7.05/bbl compared with landed price of $12.66/bbl for Saudi marker

IEA administered international energy sharing program created

**1975**

President Ford unveils U.S. energy plan that includes "windfall profits" tax on crude oil

Zaire's first oil fields go on stream

Venezuela's government outlines plans for nationalizing oil industry

Alyeska begins laying TAPS line

Frigg gas field development delayed with sinking of platform jacket

Ekofisk pipeline to U.K. starts up

First U.K. North Sea oil fields, Argyll and Forties, go on stream

Iraq completes reversible Kirkuk-Rumaila pipelines

Kuwait completes nationalization of foreign interests

Israel returns Sinai oil fields captured from Egypt in 1967 war

President Ford signs Energy Policy and Conservation Act, imposing another 40 months of oil price controls and creating 1 billion bbl strategic petroleum reserve, and Tax Reduction Act, wiping out almost all percentage depletion allowances and tightening foreign tax credits

Brazil's government authorizes Petrobras to seek risk service contracts with foreign companies

Scrapping reaches record 7.7 million dwt in depressed tanker market

**1976**

Saudi government, Aramco companies reach agreement on takeover of operations

Civil war suspends Angola-Cabinda oil production

Canada's state oil company, Petro-Canada, starts operations; Ottawa abandons oil energy self-sufficiency goal

Central America's first commercial oil production, Guatemala's Rubelsanto, goes on stream

Venezuela nationalizes oil industry

U.S. Federal Energy Administration unveils strategic petroleum reserve plan

U.S. oil imports top 1973 level in absolute terms and in percentage of total demand; Saudi Arabia becomes No. 1 source of U.S. oil imports

Harsh winter causes widespread curtailments of gas supplies by interstate gas pipelines

Interior holds lease sales of acreage off U.S. East Coast and in Gulf of Alaska

Brent field starts up in U.K. North Sea

Iraq shuts down Kirkuk-Mediterranean pipeline and shifts all crude exports to Persian Gulf tanker terminals

Qatar completes nationalization of foreign oil interests

Hondo A platform, at 945 ft the world's tallest offshore structure, is installed off California

Key discoveries revive interest in Williston basin and Overthrust belt

Elf Aquitaine, Japan National Oil Corp. predecessor founded

**1977**

OPEC adopts two tier pricing system for the first time

Nigerian National Petroleum Corp. established

TAPS line, history's costliest privately financed industrial project, completed; first Prudhoe Bay crude delivered to market

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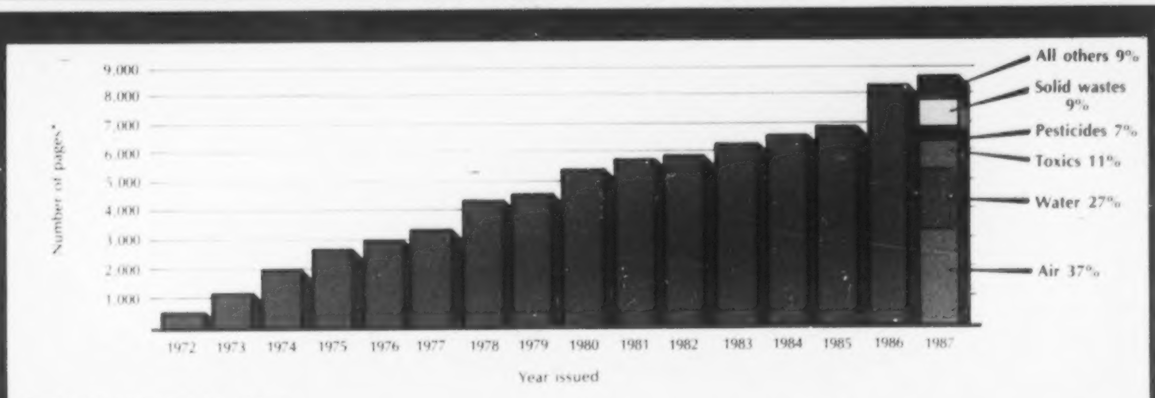


*Title 40 of the Code of Federal Regulations.

Source: Hart Environmental Management Corp. From U.S. Petroleum Strategies in the Decade of the Environment by Bob Williams, PennWell Books, 1991

With the environmental lobby continuing to home in on oil as Public Enemy No. 1, the petroleum industry faces a critical test to abandon its historically reactive stance and seize the initiative on environmental issues, educating politicians and public alike of the economic costs of bad science acting in the name of environmentalism.

## Government's role

Worldwide, prospects for government playing a positive role in energy markets are perhaps the best they've been in decades.

A wave of privatization is sweeping across the petroleum sectors of many countries as the lessons of the the 1970s price shocks finally take hold. In country after country, especially in the developing world, barriers to foreign investment in domestic petroleum sectors are falling. Oil and gas law reforms are under way on each continent. Even some OPEC members, recognizing the enormous capital needs required to sustain or build productive capacity, are opening their doors to upstream equity investment by multinational oil companies. There will be an increasingly fierce competition for that private sector capital as reformist governments kick out the sagging props from under state run oil and gas enterprises and phase out unrealistic subsidies for petroleum products. The glaring exception to this trend is, of course, the U.S., where the political climate has made petroleum sector investment a highly risky venture.

Although there has been progress on oil and gas price decontrol and deregulation in the natural gas industry, widespread legislated hostility at federal and local levels

**President Carter unveils U.S. national energy plan, focusing on conservation and oil and gas price controls**

**U.S. Department of Energy created, headed by first Sec. of Energy, James Schlesinger**

**Interior lease sale schedule includes program's first major postponements**

**FERC issues certificate for construction of Alaska-Canada natural gas pipeline system**

**First oil field goes on stream in Cameroon, offshore Kole field**

**Mexico confirms major new trend in Gulf of Campeche**

**North Sea production tops 1 million b/d; 1,000th well drilled off U.K.**

**Ekofisk-Emden gas line, world's longest subsea trunk line, starts up**

**Delivery of first oil into U.S. SPR**

**Ekofisk blowout, first major North Sea oil spill, delays Norway's fourth concession round**

**Cognac, world's heaviest and deepest water platform, installed in Gulf of Mexico**

**Pemex announces plans to lay 48 in., 750 mile gas pipeline from Reforma area to U.S.**

### 1978

**Peru regains oil self-sufficiency**

**Canada reverses itself on phasedown of light crude exports to U.S.**

**GOSO, Canada's first commercial oilsands plant, starts up**

**Congress passes President Carter's National Energy Plan, Natural Gas Policy Act, and Fuel Use Act**

**BLM, Forest Service begin U.S. wilderness review programs**

**Texaco Baltimore Canyon gas strike is first hydrocarbon discovery off U.S. East Coast**

**Amoco Cadiz tanker oil spill off France is history's biggest at 1.8 million bbl**

**Marathon brings Kinsale gas field, Ireland's first commercial discovery, on stream**

**Saltpond, Ghana's first commercial oil field, starts production**

**Chile installs its first offshore platform in Strait of Magellan**

**Colombia replaces oil concessions with association contracts**

**Pemex discovers Chicontepec oil field, claims 100 billion bbl potential reserves**

**U.K. hikes tax take on oil production**

**Scotland's St. Fergus terminal starts up**

**Revolution in Iran halts oil exports to U.S. for 68 days, causing oil shortages**

**New Zealand's Petrocorp founded**

### 1979

**Chevron drills Hibernia discovery off Newfoundland**

**Mobil drills Mary Ann discovery to touch off Mobile Bay play**

**Iranian production resumes**

**President Carter revises NEP, including phased decontrol of oil prices and proposed "windfall profits" tax**

**Norway awards first licenses north of 62nd Parallel**

**U.K. government begins to reduce BNOC's role in offshore development**

**Australia's Northwest Shelf LNG export project approved**

**First commercial oil production in Philippines starts up**

**Pemex 1 Ixtoc well blowout in Gulf of Campeche initially flows 30,000 b/d**

**Crude transshipment terminal completed in Panama**

**Shah's trial, U.S.-Iran hostage crisis causes second cutoff of Iranian oil supplies, long service station lines in U.S.**

**Israel turns over captured Alma oil field to Egypt**

cost the nation 300,000 jobs and add billions of dollars to its trade deficit. He said the bill, similar to the NES the administration proposed in January 1991, "has conservation, it has efficiency, it has R&D, and yes, it contains production."

The American Petroleum Institute called the vote "a tragedy because it is a serious setback to the future energy security and economic well being of every American. We continue to see exploration and development of the ANWR Coastal Plain as the key to increased domestic oil production. It is a project that could provide billions of barrels of oil, reduce growing dependence on insecure imports, and increase investments in our economy."

Meantime, the House energy and power subcommittee completed work on its omnibus bill, but it contained neither ANWR nor CAFE provisions. The measure was expected to go before the full energy and commerce committee early in 1992.

Rep. Phil Sharp (D-Ind.), subcommittee chairman, said the House bill would have a greater effect by far than opening ANWR and anything done on CAFE. He explained the House legislation went further in requiring energy efficiency standards for electrical appliances and set national energy efficient building codes for consideration by the states. The subcommittee staff said the House energy package would reduce U.S. energy use the equivalent of 2 million b/d by 2000 and another 3.3 million b/d by 2010 (Table 1).

**Table 1**

**Estimated effects of the House bill**

| | Oil imports avoided (b/d) | Total energy conserved (bbl of oil equivalent) |
|---|---|---|
| **2000** | | |
| Efficiency provisions | 49,000 | 851,000 |
| Natural gas | 331,000 | — |
| Alternative fuels | 780,000 | — |
| Renewable energy | 27,000 | — |
| Coal | — | — |
| Coal seam gas | 31,000 | — |
| Strategic Petroleum Reserve | 43,000 | 43,000 |
| **Total** | **1,261,000** | **894,000** |
| **2010** | | |
| Efficiency provisions | 130,000 | 2,032,000 |
| Natural gas | 283,000 | — |
| Alternative fuels | 2,790,000 | — |
| Renewable energy | 39,000 | — |
| Coal | — | — |
| Coal seam gas | 31,000 | — |
| Strategic Petroleum Reserve | — | — |
| **Total** | **3,273,000** | **2,032,000** |

Source: House energy and power subcommittee

## Oil and gas reserves

The Energy Information Administration reported that U.S. natural gas reserves increased in 1990 for the first time since 1981. Reserves inched up 1.3% to 169.346 tcf (Table 2), largely because of coalbed methane development sparked by federal tax credits. Gas reserves in Alaska and the Lower 48 not only increased, but the latter were higher than they were in 1985. Gas discoveries increased 23.3% and totaled 12.368 tcf in 1990. Major finds were drilled in New Mexico, in Alabama state water, and off Louisiana.

Crude oil reserves dropped less than 1% to 26.254 billion bbl, close to the average decline of 1.2%/year for the previous decade. Crude oil discoveries were 20% less than the annual average for the previous decade.

Natural gas liquids reserves dropped 2.4% to 7.586 billion bbl in 1990.

EIA said natural gas reserves increased in Alaska because revised estimates of future gas requirements on the North Slope caused some technically recoverable Alaskan gas to be reclassified as economically recoverable proved reserves.

Reserves in coalbed methane fields increased 1.411 tcf in 1990, while production doubled. Increases in coalbed methane reserves in New Mexico, Alabama, and Colorado accounted for three fourths of the net growth in Lower 48 proved reserves of dry gas during 1990. Development of coalbed methane resources rapidly expanded because of tax incentives and an improved understanding of the production technology.

The tax credit amounted to more than 86¢/MMBTU of coalbed methane produced in 1990, which was more than half the average U.S. wellhead price of $1.67/MMBTU during the year, EIA said. Coalbed methane proved reserves were 5.087 tcf at yearend 1990, while the revised estimate for 1989 was 3.676 tcf.

New field discoveries of dry gas amounted to 2 tcf, substantially higher than in 1989 and higher than the prior 10 year average of 1.934 tcf/year. Field extensions increased 25% to 7.95 tcf, and gas reserve additions from new reservoirs were up 7.5% at 24.12 tcf. Production of dry gas inched up 1.5% to 17.2 tcf for the year.

EIA said in recent years the net of revisions and adjustments played a larger role in sustaining Lower 48 gas reserves. In 1990, about 6.4 tcf of those revisions were added, or about twice the annual average for the previous 10 years. Larger than usual revisions were caused by more effective development drilling and increased well completions.

EIA said the 0.09%, or 247 million bbl, drop in crude oil reserves in 1990 was close to the average decline of 1.2%/year the previous decade. Most of the U.S. decline was caused by a 150 million bbl or 2.2% decline in Alaskan reserves. Lower 48 reserves of crude oil declined by only 0.5% to 19.73 billion bbl.

A number of areas had increases in reserves, including Texas with 140 million bbl and the Gulf of Mexico Outer Continental Shelf with 83 million bbl.

EIA said two thirds of the revisions and adjustments to reserves occurred in fields in four areas: Alaskan North Slope from enhanced oil recovery projects and installation of major gas handling facilities, West Texas from enhanced recovery projects, California due to expansion of heavy oil projects, and Gulf of Mexico OCS due to improved field performance.

Crude oil discoveries amounted to 689 million bbl in 1990, down 3% from 1989 and 20% less than the 861 million bbl/year average for the previous decade. Texas, Gulf of Mexico OCS, and Alaska dominated the crude discoveries with more than three fourths of the total.

**Table 2**

**U.S. reserves at a glance**

| | |
|---|---|
| **CRUDE OIL (billion bbl)** | |
| Yearend 1989 | 26.501 |
| Yearend 1990 | 26.254 |
| Decrease | 0.247 |
| **NATURAL GAS (tcf)** | |
| Yearend 1989 | 167.116 |
| Yearend 1990 | 169.346 |
| Increase | 2.230 |
| **NATURAL GAS LIQUIDS (billion bbl)** | |
| Yearend 1989 | 7.769 |
| Yearend 1990 | 7.586 |
| Decrease | 0.183 |

Source: Energy Information Administration

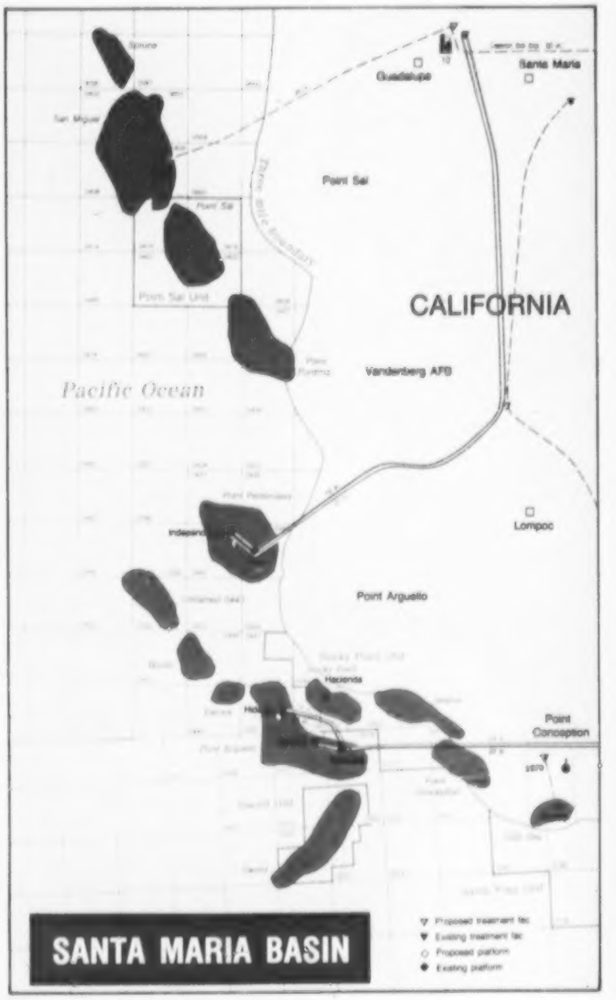
**Table 3**

**U.S. gas resources and reserves**

| | 1990 | 1988 |
|---|---|---|
| | tcf | |
| Gas field resources* | | |
| Probable, current fields | †190.1 | 173.2 |
| Possible, new fields | 267.8 | 267.1 |
| Speculative, frontier | 262.9 | 265.2 |
| **Subtotal** | **720.8** | **705.5** |
| Coalbed methane resources* | | |
| Probable§ | 9.6 | — |
| Possible§ | 51.2 | — |
| Speculative§ | 84.4 | — |
| **Subtotal** | **145.1** | **90.1** |
| Proved reserves¶ | ¶167.1 | 167.2 |
| **Total** | **1,033.0** | **982.8** |

*Most likely values. †Includes 24.6 tcf previously carried as proved reserves in Alaska. §Not determined separately in 1988 report. ¶Department of Energy estimate; reflects removal of 24.6 tcf of Alaskan gas previously carried as proved reserves.

Source: Potential Gas Committee



production costs.

## Supply/demand outlook to 2000

U.S. crude oil production is in the midst of a long slide that will dip to less than 6 million b/d by the end of the century, the Independent Petroleum Association of America's supply/demand committee forecast near midyear 1991.

The committee said U.S. production will amount to 5.7 million b/d in 2000, off about 1.6 million b/d from 1990 and 3.3 million b/d from the 1980s peak achieved in 1985 (Fig. 1).

U.S. crude oil flow hit its all time high in 1970 at 9.637 million b/d. Production has fluctuated a bit since then, but the trend has been down at an average rate of 1.4%/year, or 115,000 b/d/year.

Meantime, the IPAA committee said in its first long range outlook, U.S. total petroleum imports will rise to 11.1 million b/d in 2000, up about 3 million b/d from 1991. By 2000, total imports will meet 60% of domestic petroleum demand, compared with less than 50% in 1991.

The committee said U.S. oil demand will rise at an average rate of less than 1%/year during the 1990s. Competition among fuels and continued efficiency gains will keep a lid on the growth rate. U.S. oil demand showed little growth during the 1980s, largely because of conservation in response to oil price increases and compliance with the federal government's CAFE standards for vehicles.

Utilization rate for U.S. refineries will be slightly higher than in 1990, the committee predicted. Department of Energy figures pegged the 1990 average monthly utilization rate at 87.27%, flat with 1989's 86.28%. High point for 1990 occurred in July, when utilization climbed to 92.6%. Average monthly utilization did not top 90% in 1989, DOE data show.

The IPAA committee forecast continued growth in U.S. natural gas use during the 1990s, rising to 22 tcf/year by 2000. Most of the growth will occur in the electrical power and industrial markets. Construction in the utility sector will favor gas because of things like requirements of the Clean Air Act (CAA). And natural gas will be the fuel of choice for projects in which short lead times are critical.

The U.S. will see an average rise of 1.1%/year in its natural gas flow, which will reach 19.1 tcf/year by 2000. Coalbed methane and other sources based on improved technology will contribute an increasing share of production. Imports will climb to 3 tcf/year by the end of the century.

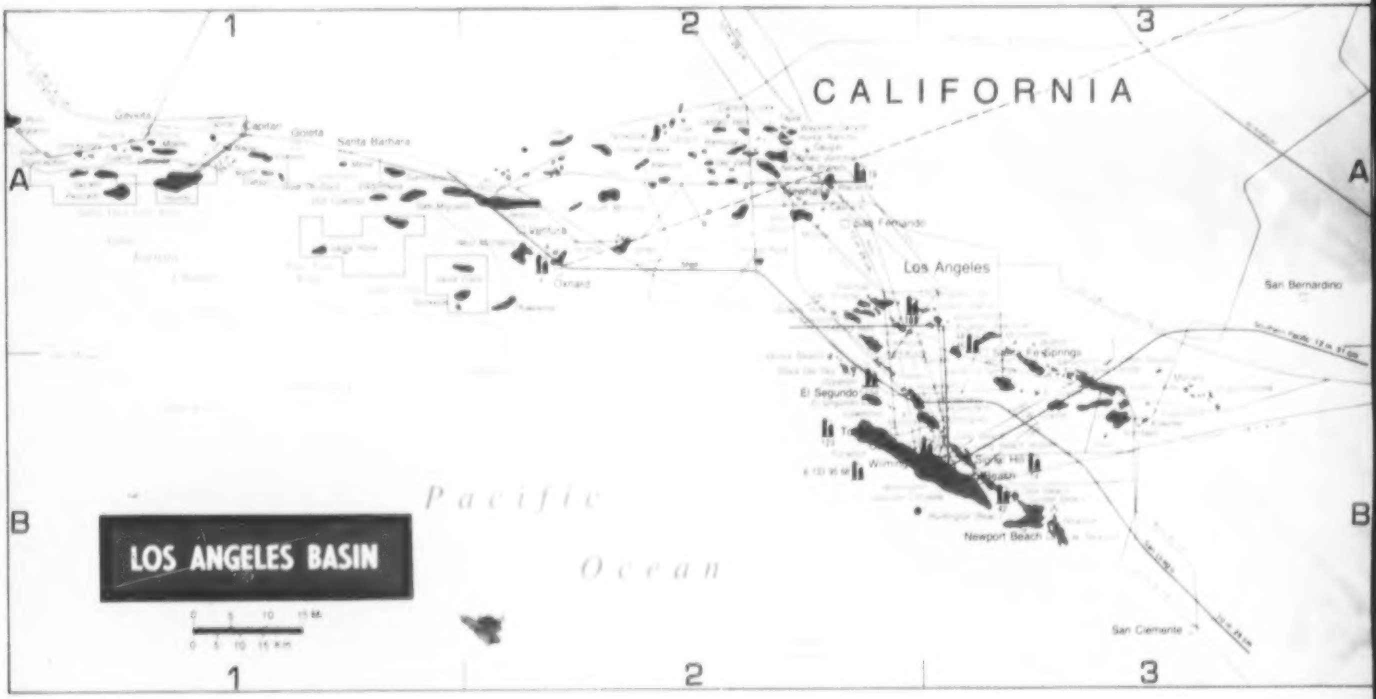
The rate of growth in U.S. total energy demand will slow in the 1990s, the committee said. The energy/gross national product ratio will continue to reflect gains in efficiency and reduced energy intensity. Energy demand will grow at only half the rate of economic growth during the decade.

In recent years, oil and natural gas lost market share to coal and nuclear power. But that trend will turn around during the 1990s. That's because construction programs for large nuclear and coal fired power plants are winding down, and use of existing coal fired plants and construction of new ones will be reined by the CAA. In addition, hydroelectric potential is limited by lack of development opportunities.

## Oil imports predicted to rise

The U.S. was importing 7.47 million b/d of crude oil and petroleum products, or 43.4% of total demand, as 1992 approached. Forecasters warned the volume will continue to rise as U.S. production declines.

East Coast states' dependence on imported oil will increase sharply in this decade, the Coalition for American Energy Security (CAES) predicted in October 1991. It said by 2000 New England's reliance on imported oil will increase from the current 91% to 98%. Middle Atlantic states will



## Table 4

### U.S. West Coast oil supplies*

| Source | 1976 | 1980 | 1990 | 2000 | 2006 | 2010 |
|---|---|---|---|---|---|---|
| | Million b/d | | | | | |
| Alaska | 0.20 | 1.00 | 1.50 | 1.00 | 0.70 | 0.50 |
| California | 0.90 | 1.00 | 0.90 | 0.80 | 0.70 | 0.60 |
| Imports | 1.00 | 0.40 | 0.20 | 1.10 | 1.60 | 1.90 |
| Total | 2.10 | 2.40 | 2.60 | 2.90 | 3.00 | 3.00 |
| | % | | | | | |
| Alaska | 10 | 42 | 58 | 34 | 23 | 17 |
| California | 43 | 42 | 35 | 27 | 23 | 17 |
| Imports | 47 | 16 | 7 | 39 | 54 | 66 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 |

*West Coast defined as Petroleum Administration for Defense Dist. 5: Alaska, Washington, Oregon, Nevada, California, Arizona, and Hawaii.

Source: Bruce Wilson from California and Alaska state data

on products shipments from other sections of the country and from overseas. Wilson predicted South Atlantic region demand will grow from 2.3 million b/d in 1990 to 2.6 million in 2000. And by the turn of the century, more than 75% of the oil delivered to the South Atlantic will be imported. Domestic crude supplies to the region will fall to less than half of the 1980 level.

Wilson said Florida will be affected most because of its high gasoline demand. Because Florida is the only state in the region not supplied by a pipeline, it relies on waterborne shipments for all of its oil.

But as demand increases in other states, U.S. refineries are likely to cut waterborne shipments first, redirecting them to pipeline deliveries, which are less expensive and risky, Wilson said.

In May 1991 CAES released a Wilson study saying that without a major new oil discovery in Alaska, Pacific Coast states again will become largely dependent on imported oil by 2010, when imports will account for 66% of their supplies (Table 4).

The study noted that in the mid-1970s Alaskan North Slope (ANS) production replaced similar grade oil from the Persian Gulf in West Coast refineries. But Prudhoe Bay field production peaked in 1989 and is due to drop dramatically by the end of the 1990s.

After North Slope production began to decline, falling output was at first offset by reduced shipments to the eastern U.S. But when reduced ANS production hits the West Coast in earnest, the decline will be absorbed mainly by California, Hawaii, and, to a lesser degree, Washington.

Wilson's study said ANS crude will be replaced by Persian Gulf oil because they are similar chemically, and refineries can switch to Arab light without incurring more capital expenses.

California, Nevada, and western Arizona will be 50% dependent on imported oil by 2000, and Washington-Oregon will be 66% dependent by then. Hawaii will become totally dependent on non-U.S. oil by 1996. That state in 1991 received 50,000 b/d of oil from Alaska, or 38% of its supply.

ANS crude has not been widely used in Hawaii because the two refineries there are geared to process high gravity, low sulfur, imported crude that is well suited for Hawaii's petroleum product mix—jet fuel accounts for 44% of the state's total requirements—and there are stiff sulfur emission rules.

The report was the first in a series of regional oil import dependence studies prepared for CAES, which was formed to push for leasing of the ANWR Coastal Plain. Its members included oil companies and oil industry associations, as well as other groups.

## Gas pipelines set the pace

Gas transmission lines set the pace for U.S. pipeline construction in 1991. Pipeliners had their sights set on construction of 4,858 miles of gas transmission or gathering lines 4 in. and larger in 1994 and beyond. By contrast, plans

**New and potential federal environmental costs to the U.S. oil industry** Fig. 2

| Requirement | Effective date | Initial cost | Annual operational cost | Total annualized cost |
|---|---|---|---|---|
| | | Million 1990 $ | | |
| **AIR** | | | | |
| **Benzene Neshaps*** | March 1992 | 2,000 | NA | 235 |
| **Phase II Rvp reductions** | May 1992 | NA | NA | 464-1,490 |
| **Diesel fuel sulfur reduction** | Oct 1993 | 3,313 | 340 | 360-1,170 |
| **Stage II controls at service stations†** | 1995 | NA | NA | 193-324 |
| **Clean fuels** | 1992-2000 | 3,000-4,000 | NA | 1,372-7,924 |
| **Air toxic—MACT§ standards†** | 1992-2010 | 2,944 | 614 | 1,041 |
| **Marine vapor controls†** | 1994 | 2,362-3,052 | 362-389 | 629-745 |
| **WASTE** | | | | |
| **Primary sludge listing** | March 1991 | 42-407 | 54-103 | 51-131 |
| **Toxicity characteristic** | 1990-91 | NA | NA | 2,671-5,549 |
| **Corrective action at hazardous waste facilities** | 1995 | NA | NA | 14-90 |
| **WATER** | | | | |
| **Double hulls on U.S. tankers** | 1995-2015 | 3,991 | 178 | 712 |
| **Effluent limitations and new source performance standards** | 1993 | 76-2,583 | 46-646 | 54-949 |
| **Marine spill response** | Feb 1993 | 435 | 100 | 151 |
| **Ban on surface discharges†** | 1997 | 0-1,868 | 0-362 | 0-581 |
| **Underground injection controls†** | 1994 | 0-21,683 | 77-529 | 77-3,076 |
| **TANKS** | | | | |
| **Underground storage tanks** | 1989-1998 | NA | NA | 1,173 |
| **SPCC¶ program for aboveground tanks †** | 1994 | 896-11,722 | 00-408 | 146-1,834 |
| **Secondary containment for aboveground tanks†** | 1994 | 4,131-5,825 | 0 | 435-624 |

*National emission standards for hazardous air pollutants program. †Specific requirements are expected from a federal agency but have not yet been proposed. §Maximum achievable control technology. ¶Spill prevention control and countermeasures program.

Source: American Petroleum Institute

paign in defense of diminishing U.S. operations of major oil and gas companies. API and oil company executives acknowledged with alarm the accelerating shift of major company exploration and production activities away from the U.S. And they slammed government policies encouraging the migration.

The major producing industry "isn't abandoning the U.S.," declared Allen E. Murray, outgoing API chairman and chairman, president, and chief executive officer of Mobil Corp. "It's being thrown out," he told a news conference.

Murray and other speakers warned that the costs of burgeoning environmental regulations will damage U.S. economic interests in an increasingly competitive world. To punctuate the message, API released a study estimating that by the late 1990s new or potential environmental regulations will raise petroleum industry costs, including annualized costs of required investments, by $15-23 billion/year (Fig. 2). By comparison, profits of 22 of the largest U.S. oil companies totaled $21.3 billion in 1990.

Estimated petroleum industry costs represent 12-17% of what API expects to be total national environmental outlays in 2000. The study noted that its cost estimates are by

Table 1

## Oil and gas completions and footage for gulf areas

| | Oil well completions | | | | | Gas well completions | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Alabama offshore | Gulf of Mexico northern federal waters | Louisiana offshore | Texas offshore | Total Gulf of Mexico | Alabama offshore | Gulf of Mexico northern federal waters | Louisiana offshore | Texas offshore | Total Gulf of Mexico |
| 1981 | NA | 4 | [illegible] | 9 | 163 | NA | 0 | 207 | 72 | 279 |
| 1982 | NA | 17 | 113 | 17 | 147 | NA | 10 | 196 | 94 | 300 |
| 1983 | NA | 3 | 231 | 21 | 165 | NA | 8 | 124 | 129 | 261 |
| 1984 | 0 | 6 | 310 | 2 | 318 | 1 | 1 | 278 | 75 | 355 |
| 1985 | 0 | 7 | 139 | 22 | 168 | 3 | 3 | 150 | 90 | 246 |
| 1986 | 0 | 16 | 159 | 10 | 185 | 1 | 2 | 117 | 90 | 210 |
| 1987 | 0 | 24 | 163 | 9 | 196 | 1 | 2 | 106 | 35 | 144 |
| 1988 | 0 | 13 | 141 | 1 | 155 | 1 | 12 | 113 | 57 | 183 |
| 1989 | 0 | 47 | 205 | 13 | 265 | 0 | 28 | 293 | 154 | 475 |
| 1990 | 0 | 16 | 243 | 33 | 292 | 3 | 10 | 305 | 137 | 455 |
| 1991* | 0 | 17 | 75 | 8 | 100 | 3 | 9 | 154 | 69 | 235 |

| | Oil well footage | | | | | Gas well footage | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Alabama offshore | Gulf of Mexico northern federal waters | Louisiana offshore | Texas offshore | Total Gulf of Mexico | Alabama offshore | Gulf of Mexico northern federal waters | Louisiana offshore | Texas offshore | Total Gulf of Mexico |
| 1981 | NA | 47,329 | 1,412,245 | 80,713 | 1,540,287 | NA | 0 | 2,112,923 | 679,994 | 2,792,917 |
| 1982 | NA | 183,832 | 1,117,360 | 171,734 | 1,482,926 | NA | 123,817 | 1,991,511 | 824,041 | 2,939,369 |
| 1983 | NA | 158,276 | 2,264,523 | 187,287 | 2,610,086 | NA | 91,322 | 1,430,347 | 1,189,822 | 2,711,491 |
| 1984 | 0 | 56,310 | 2,952,490 | 15,953 | 3,024,753 | 21,000 | 10,275 | 2,658,371 | 707,151 | 3,396,797 |
| 1985 | 0 | 75,900 | 1,402,400 | 195,600 | 1,673,900 | 64,000 | 27,400 | 1,540,400 | 907,800 | 2,540,000 |
| 1986 | 0 | 176,320 | 1,457,400 | 96,602 | 1,730,322 | 22,390 | 15,481 | 1,298,367 | 998,752 | 2,334,990 |
| 1987 | 0 | 260,845 | 1,534,846 | 100,091 | 1,895,782 | 21,710 | 21,128 | 1,168,353 | 376,961 | 1,588,152 |
| 1988 | 0 | 131,995 | 1,306,788 | 10,200 | 1,448,983 | 22,950 | 92,553 | 1,171,555 | 593,957 | 1,881,415 |
| 1989 | 0 | 504,356 | 1,861,900 | 126,060 | 2,492,316 | 0 | 254,838 | 2,915,083 | 1,499,214 | 4,669,135 |
| 1990 | 0 | 169,057 | 2,405,389 | 327,070 | 2,901,516 | 27,272 | 103,962 | 2,875,241 | 1,183,752 | 4,190,227 |
| 1991* | 0 | 188,198 | 673,543 | 72,227 | 933,968 | 9,701 | 99,413 | 1,605,862 | 652,210 | 2,367,186 |

*1991 well completions and footage through October.
Sources: Rig count — Baker Hughes Inc.
Well completions — American Petroleum Institute
Data provided by Oil & Gas Journal Energy Database

Ann gas processing plant in southern Mobile County, Ala.

In November 1991, Mobil began producing about 40 MMcfd of Norphlet gas from a well on Mobile Block 823, 4 miles south of Dauphin Island, the first production in federal water off Alabama. Altogether, Mobil drilled six wells in Block 823 field, with one flowing 62 MMcfd of gas.

Operator Mobil has a 50% interest in Block 823 field, Texaco 25%, Conoco 12.5%, Exxon 7.5%, and Agip 5%.

Exxon was well along with plans to spend $3 billion to start Norphlet gas production in Mobile Bay, where its leasehold surrounds Mobil's Mary Ann development. By late 1993, Exxon expects to begin moving about 300 MMcfd of gas from 12 Norphlet wells to an onshore treating plant in southern Mobile County.

Also in state water, Arco Oil & Gas Co. installed a platform just north of Dauphin Island to produce about 70 MMcfd of Miocene gas at 2,000 ft. Production through the facility was to begin in December 1991.

In late December 1991, Unocal Exploration Corp., the largest acreage holder in the gulf OCS off Alabama with 83,563 acres in 24 blocks, announced a Norphlet gas discovery on Mobile Block 916, about 40 miles southeast of Mobile.

Unocal's 2 OCS-G 5753 well flowed 41 MMcfd of gas through a [illegible] in. choke with 4,368 psi flowing tubing pressure from 248 ft of perforations below 22,700 ft. The find extended the Norphlet play south.

Operator Unocal and Chevron each own a 45.65% interest in the find and Bechtel Energy Resources Corp. 8.7%. The partners hold identical interests in seven federal blocks covering more than 40,000 acres around Block 916.

Chevron early in 1991 disclosed a Norphlet discovery below 21,000 ft on Destin Dome Block 56 in the gulf's eastern planning area, capping a 3 year search. The discovery well flowed 22 MMcfd of gas.

Operator Chevron and Conoco each own a 33.33% interest in the well, and Murphy Oil Corp. and its Odeco subsidiary 16.67% each.

Chevron's leasehold in the vicinity, covering 35 federal tracts and one state tract off Florida, was concentrated in three segments: Destin Dome 56, Mobile Blocks 861 and 916. Chevron expects to begin production on Mobile 861 in 1994, with Mobile 916 and Destin Dome 56 coming on line in 1996. Drilling in the area is expected to continue until 2001.

### Other activity

In other gulf action during 1991:

- On South Marsh Island Block 147, Phillips Petroleum Co. in the second quarter completed three wells and tied them back to a platform installed on the tract in 1990. Block 147 production by yearend had reached 92 MMcfd of gas and 4,000 b/d of condensate.

A fourth Phillips well on the acreage was awaiting completion at yearend. Two or three more wells are planned for 1992 on Block 147.

Phillips also participated in two projects in the Ship Shoal area that advanced during 1991.

In November on Ship Shoal Block 149, Phillips installed a

### Table 2

**Baker Hughes active rig count**

| | Central gulf | Western gulf |
|---|---|---|
| 1981 | 154 | 74 |
| 1982 | 137 | 78 |
| 1983 | 124 | 48 |
| 1984 | 132 | 55 |
| 1985 | 129 | 48 |
| 1986 | 69 | 19 |
| 1987 | 65 | 19 |
| 1988 | 88 | 22 |
| 1989 | 72 | 22 |
| 1990 | 76 | 22 |
| 1991* | 57 | 15 |

*1991 is average rigs through November.
Source: Baker Hughes Inc.
Data provided by Oil & Gas Journal Energy Database

production platform and at yearend was hooking up two wells drilled in 1990. Pliocene oil production was expected to peak at 1,000 b/d from pay at 5,000-6,000 ft.

Phillips owns 85% to 100% interests in the field.

In Odeco operated Ship Shoal Block 113 field, partners drilled four development wells and two field extensions. Production is from multiple Miocene/Pliocene pays at 8,000-13,000 ft. About eight wells/year for the next 3-4 years are planned on the acreage.

In South Timbalier 205/206 field, operator Amerada Hess and Phillips in February completed initial development with the prospect's 12th well. Field production reached a year-long high in October with production of 160 MMcfd of gas.

Gulf-wide in 1991, Phillips participated in nine exploratory well and 26 development wells.

- Marathon Oil Co. drilled a discovery well on its Lobster prospect in 775 ft of water on Ewing Bank Block 873. At yearend, Marathon was drilling the tract's third delineation well.

Marathon also drilled a discovery well and two delineation wells in 370 ft of water on South Pass Block 87.

Operator Marathon, with a 66.67% interest, estimated South Pass 87 reserves at 80 million BOE in sands at 9,500-13,000 ft. The company plans to set a platform and begin production in 1994.

The first South Pass 87 delineation well was drilled to 16,715 ft from a surface location 2,300 ft southwest of the discovery well. The well cut 82 ft of oil and gas pay and established a hydrocarbon column extending over a 600 ft structural interval.

Marathon at yearend was drilling a second delineation well through a template at the first delineation well to a bottomhole location 4,500 ft west and 800 ft downdip of the discovery well. Pending further delineation of the South Pass 87 discovery, Marathon tentatively plans to install a platform in 1994.

Operator Marathon, Amerada Hess Corp., and OKC Limited Partnership each own one-third interests in the tract.

In a separate South Pass area project, Marathon participated in two more delineation wells from a subsea template on Block 86 to a 70 million BOE field on Block 89. Since drilling the South Pass 89 discovery in 1988, Marathon has drilled and suspended five wells from the template.

Marathon and partners planned to install a platform on South Pass 89 early in 1992, with production beginning at midyear. Liquids production is expected to peak at more than 20,000 b/d. Gas facilities are designed to handle as much as 100 MMcfd.

Operator Marathon, Amerada Hess, OKC, and Louisiana Land & Exploration Co. each own a 25% interest in the development.

Gulf-wide in 1991, Marathon participated in 12 exploratory and nine development wells, making it one of the few gulf operators to increase its emphasis on exploratory drilling. The company participated in five exploratory and 15 development wells in the gulf in 1990 and five exploratory and 12 development wells in 1989.

- Texaco U.S.A. in August launched the jacket and installed the deck for its Tick platform in 750 ft of water on Garden Banks Block 189. It is the deepest water Texaco operated platform in the world.

At yearend, Texaco and Unocal, 50-50 partners in the project, were awaiting a permit from MMS to lay an 8 in. pipeline from Tick platform to the High Island Pipeline System about 28 miles away.

Tick production is expectd to peak at 10,000 b/d of oil and 60 MMcfd of gas-from Pleistocene sands at 5,000-8,000 ft.

Texaco participated in 44 wells in the gulf during 1991, 26 wildcats and 18 development wells. Because of low gas prices, the company favored liquids prospects.

- Mobil participated in development on Ewing Bank Block 826, Eugene Island Block 330, and Green Canyon Block 18.

It completed initial development on Ewing Bank 826 with four appraisal wells to Pliocene/Pleistocene oil sands at 10,000-13,500 ft in 480 ft of water.

Mobil also completed initial development of Green Canyon 18 with two flexure trend wells drilled to Pliocene/Pleistocene sands at 8,000-13,500 ft in 760 ft of water.

It participated in six exploitation wells in Pennzoil operated Eugene Island 300 field. The wells went to Pleistocene oil and gas sands at 4,000-8,000 ft in 250 ft of water. Mobil owns a 25% interest in the field.

Gulf-wide in 1991, Mobil participated in 33 development wells—17 Mobil operated—and five exploratory wells.

- Arco finished rebuilding B platform in South Pass Block 60 field.

B platform, the hub of South Pass 60 field, was damaged by an explosion and fire in March 1989 that cut production to 8,000-10,000 b/d of oil from 18,000 B/d. The new installation restored production to 20,000 b/d.

On South Pass Block 52 field, Arco installed a tripod platform in 550 ft of water.

Production from Pliocene sands at 9,000-10,000 ft was to begin in January 1992. The company planned to drill three wells from the platform using a new minimum area rig concept by Helmerich & Payne.

Arco's overall strategy in the gulf in 1991 continued to focus on being a low cost producer. But low gas prices meant the company had to delay or drop some projects. Low gas prices also prompted Arco to curtail drilling and place more emphasis on oil prospects.

Arco drilled 44 wells in the gulf during 1991, including 20 exploratory and 24 development wells. In 1990, the company drilled 55 gulf wells.

- Nerco Oil & Gas Inc. and CNG Producing Co. installed a four pile platform in 198 ft of water on West Cameron Block 554 field and began producing gas at a rate of 12 MMcfd. Block 554 field production was expected to increase to 50 MMcfd early in 1992. The $9.5 million platform has a design capacity of 100 MMcfd.

Nerco and CNG planned more delineation and exploratory drilling from the platform in 1992.

A delineation well by Nerco and Agip Petroleum Co. in 419 ft of water on Vermilion Block 395 cut more than 400 ft of net pay in five Pleistocene intervals. Partners began engineering for an unmanned platform, pending a finding of commercial capacity.

Nerco and Agip in November installed a platform in 467 ft of water on nearby Vermilion Block 412, where production was scheduled to begin early in 1992.

The partners hired OPI International Inc. for the installation and to lay a 16 in. gas pipeline 7.65 miles between a

### Table 1

## Breakout of net income

| | 1989 | 1990 | Change | |
|---|---|---|---|---|
| | Billion $ | | | % |
| INTEGRATED COMPANIES AND REFINERS | | | | |
| Upstream | 0.7 | 1.0 | 0.3 | + 61 |
| Downstream | 0.9 | 0.9 | — | + 3 |
| Other* | −0.4 | −0.5 | −0.1 | — |
| **Subtotal** | **1.1** | **1.4** | **0.3** | **+ 27** |
| OIL AND GAS PRODUCERS | | | | |
| Upstream | — | 0.7 | 0.7 | — |
| Downstream | 0.1 | — | −0.1 | − 34 |
| Other* | 0.1 | 0.2 | 0.1 | + 68 |
| **Subtotal** | **0.2** | **1.0** | **0.8** | **+370** |
| **Total** | **1.3** | **2.4** | **1.1** | **+ 81** |

*Net income generated by foreign activities and other Canadian operations.

Source: Petroleum Monitoring Agency

### Table 2

## Breakout of spending

| | 1989 | 1990 | Change | | Share of total 1989 | Share of total 1990 |
|---|---|---|---|---|---|---|
| | Billion $ | | | % | % | |
| UPSTREAM | | | | | | |
| Exploration | 2.5 | 2.6 | 0.1 | 4 | 32 | 30 |
| Development | 0.8 | 1.0 | 0.2 | 23 | 10 | 11 |
| Production | 1.9 | 2.1 | 0.2 | 7 | 24 | 24 |
| Nonconventional* | 0.4 | 0.7 | 0.3 | 73 | 5 | 8 |
| **Subtotal** | **5.7** | **6.4** | **0.7** | **13** | **72** | **74** |
| Downstream | 1.3 | 1.1 | −0.2 | −12 | 16 | 13 |
| Other energy related | — | — | — | −36 | — | — |
| All other | 0.4 | 0.4 | — | 9 | 5 | 5 |
| **Subtotal in Canada** | **7.4** | **8.0** | **0.6** | **8** | **93** | **92** |
| Spending abroad | 0.5 | 0.7 | 0.2 | 22 | 7 | 8 |
| **Gross total** | **7.9** | **8.6** | **0.7** | **9** | **100** | **100** |
| Receipts† | 0.2 | 0.1 | −0.1 | −59 | | |
| **Net total** | **7.7** | **8.6** | **0.9** | **11** | | |

*Includes oilsands and nonconventional heavy oil projects. †Includes incentives, grants, tax credits, and other receipts.

Source: Petroleum Monitoring Agency

outlays abroad rose 22% to $655 million. Spending abroad as a share of total capital spending was up 1 percentage point to 8% of the total in 1990.

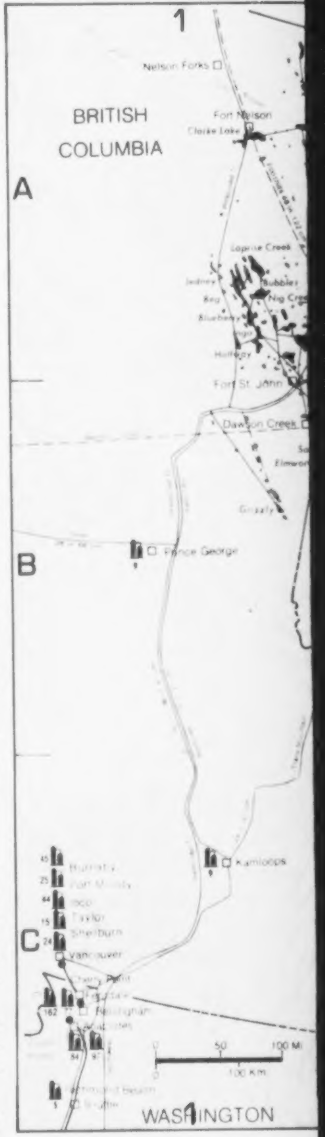
Upstream spending remained the largest component of total capital outlays, accounting for 74% in 1990, up 2 percentage points from 1989. Downstream spending declined 12%, while other outlays rose 5%.

PMA said the crude oil price rise resulting from the Persian Gulf crisis seemed to have caused a slight increase in capital outlays during the latter part of 1990. Capital spending, especially for development projects, rose in an effort to bring new production on stream.

Upstream outlays by Canadian controlled companies increased 27.1% to $3.337 billion, while those of foreign controlled companies rose only 1% to $3.087 billion. The Canadian controlled group of companies' share of upstream capital spending rose 6 percentage points to 52% of the total in 1990.

Increases in spending for the Bi-Provincial Upgrader, classified with oilsands outlays, accounted for most of the increase of 73% in capital spending in the nonconventional sector. As a result, upstream capital spending increased 13% to $6.4 billion in 1990.

The 46,000 b/d capacity upgrader, carrying a price tag of $1.3 billion, was under construction at Wilton, Sask., by a combine of Husky and three Canadian governments. The group aimed for a mid-1992 start-up to convert heavy crude oil and bitumen from the Lloydminster and Cold Lake area and distillate from Husky's Lloydminster refinery to high grade synthetic crude. Husky is operator with a 26.67% interest. Its partners are the federal government with 31.66%, Alberta 24.17%, and Saskatchewan 17.5%.



### Alberta's holiday on royalty

The Alberta government's royalty holiday suspended requirements for royalties of as much as 25% on newly completed oil wells for as long as 2 years in response to industry pleas for aid. Provincial Energy Minister Rick Orman announced the move and said the government was studying industry requests for changes in Alberta's royalty structure.

Orman said the royalty holiday may eventually increase royalty revenues by increasing oil production.

The royalty incentives apply to oil wells only and vary according to well type. Suspended wells will qualify for a 5 year royalty holiday if reactivated by Apr. 1, 1993.

New wells drilled by the same date in remote or costly operating areas of northern Alberta and the Rocky Mountain Foothills qualify for 2 year royalty holidays. New wells in other areas have a Mar. 31, 1992, deadline to qualify for a 2 year holiday and will get a 1 year holiday if drilled after that date. They must be at least 1½ miles from existing wells but can be in the same field.

Development wells drilled by Mar. 31, 1993, will get a 1 year royalty holidays with a ceiling of $400,000.

The program, adminstered by the Alberta Energy Resources Conservation Board, drew mostly a welcome response from industry.

The Independent Petroleum Association of Canada said it will have a positive effect on exploration economics and increase winter drilling activity. The Canadian Association of Oilwell Drilling Contractors said the change will provide

The 1990 export performance increased Canada's share of the U.S. gas market to an all time high of 7.7% from 7.1% in 1989, 7% in 1988, 5.9% in 1987, and only 4.6% in 1986.

### Pushing gas as a motor fuel

Canadian Federal Energy Minister Jake Epp in October 1991 launched the Natural Gas Vehicle Refueling Appliance Program, financed at $4 million, to encourage the use of natural gas as a transportation fuel.

Under the program, the federal government will contribute a $1,500 package for conversion of a vehicle to natural gas and installation of a vehicle refueling appliance.

The package includes a $500 conversion grant available through the existing natural gas vehicle program and a $1,000 payment toward purchase of a natural gas vehicle appliance.

Funding will come from market development incentive payments, money made available to the federal government by Alberta gas producers to expand the markets for Alberta gas in Canada. The program will operate in Alberta and provinces to the east where Alberta natural gas is available.

Epp disclosed the program at the official opening of the new Fuelmaker Corp. factory in Toronto. Fuelmaker manufactures natural gas vehicle refueling appliances. It is a joint venture of B.C. Gas, Sulzer Canada Inc., and Questar Corp., Salt Lake City.

### Sale of shares in Petro-Canada

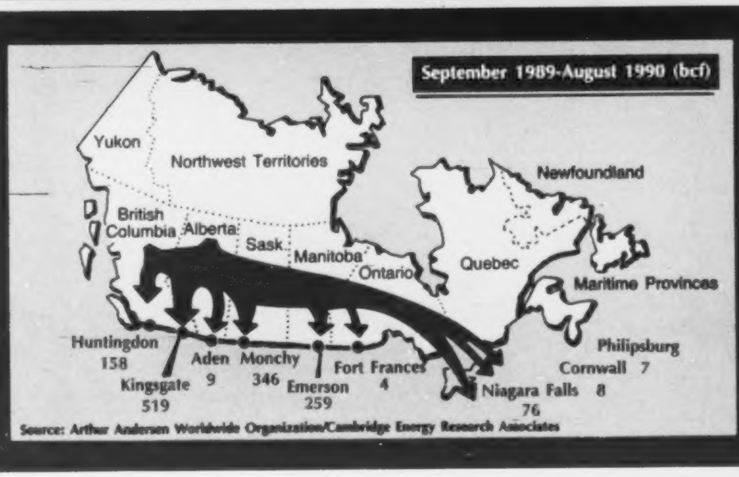
A public offering of 39.5 million shares in Canada's state oil company at $13/share was sold out in summer 1991, netting the federal government $513.5 million.

The 42 million shares sold represented about 19.5% of the company. The sale was the first step in federal efforts to privatize Petro-Canada, Calgary.

The share price was set at $13 instead of an expected $15 in light of losses earlier in the year. Analysts estimated the company's net asset value at $26.48/share.

About 8.2 million shares were sold to foreign investors and 2.5 million shares to Petro-Canada employees. The rest were sold to individual Canadian buyers and institutional buyers.

Proceeds were to be applied to Petro-Canada's short term debt and its 25% share of development costs for Hibernia oil field on the Grand Banks off Newfoundland. ▪



September 1989-August 1990 (bcf)

Source: Arthur Andersen Worldwide Organization/Cambridge Energy Research Associates

*Great Lakes Gas Transmission Co.'s system adds capacity to carry more Canadian gas to the U.S. Midwest and Northeast. Construction by the 50-50 venture of Coastal Corp. and TransCanada PipeLines Ltd. is part of industry's campaign to step up gas sales.*

### China's buildup in production

| — | Million metric tons of oil |
|---|---|
| 1982 | 102.0 |
| 1983 | 106.0 |
| 1984 | 114.6 |
| 1985 | 124.9 |
| 1986 | 130.7 |
| 1987 | 134.0 |
| 1988 | 137.0 |
| 1989 | 137.6 |
| 1990 | 138.0 |

Source: China Features from China National Petroleum Corp. data

### Production in China's major fields

|  | 1989 | 1990 | First half 1991 |  |  |  |
|---|---|---|---|---|---|---|
|  | Oil |  |  | Percent of annual plan | Gas Billion cu m | Percent of annual plan |
| Area | Million metric tons |  |  |  |  |  |
| Daqing | 55.55 | 55.62 | 27.70 | 49.9 | 11.00 | 51.4 |
| Shengli | 33.35 | 33.50 | 16.60 | 49.6 | 8.00 | 55.1 |
| Liahoe | 13.35 | 13.60 | 6.80 | 49.4 | 9.00 | 54.9 |
| Xinjiang | 6.40 | 6.80 | 3.40 | 48.3 | 2.70 | — |
| Zhongyuan | 6.98 | 6.30 | 2.90 | 48.7 | 6.36 | 50.1 |
| Huabei | 5.49 | 5.35 | 2.60 | 51.4 | 1.20 | 45.9 |
| Dagang | 4.08 | 3.83 | 1.90 | 50.2 | 1.60 | 47.1 |
| Jilin | 3.41 | 3.55 | 1.70 | 50.6 | 0.60 | — |
| Henan | 2.55 | 2.52 | 1.20 | 49.3 | 0.16 | — |
| Changqing | 1.43 | 1.46 | 0.80 | 50.3 | 0.18 | — |
| Cnooc* | 0.90 | 1.26 | 1.12 | 62.5 | — | — |
| Jiangsu | 0.80 | 0.85 | 0.40 | 49.2 | 0.17 | — |
| Qinghai | 0.73 | 0.80 | 0.50 | 51.2 | 0.38 | — |
| Yumen | 0.54 | 0.54 | 0.30 | 45.5 | 0.19 | — |
| Jianghan | 0.39 | 0.38 | 0.40 | 52.4 | 0.28 | — |
| Jidong | — | 0.35 | 0.20 | 50.0 | 0.12 | — |
| Sichuan | 0.12 | 0.13 | 0.07 | 60.3 | 32.30 | 50.9 |
| Tarim | — | 0.15 | 0.30 | 68.5 | — | — |

*All offshore.

Source: China Features from China National Petroleum Corp. data

were planned. With the offshore extension, Zhao Liusheng, field deputy chief geologist, estimates the area's potential reserves at as much as 1 billion bbl.

Bohai offshore production climbed to 24,000 b/d from three fields developed by a Sino-Japanese joint venture. The most recent Bohai start-up, Chengbei, produced 8,000 b/d. Three other fields are under development, and Bohai production was expected to climb to 40,000 b/d of oil and about 48 MMcfd of gas.

State owned Bohai Oil Co. signed seven contracts with multinational oil companies covering more than $700 million in foreign investment.

## East China Sea gas

Shanghai planned to take delivery of natural gas from Pinghu oil and gas field in the East China Sea for residential consumption.

Du Yuanshun, director of Shanghai Public Utilities Bureau, told China Daily the city was prepared to use 5.96 MMcfd of gas, equal to production of Pudong Gasworks, for 10-15 years.

Only 54% of the urban households have a gas supply, although the city supplies residents with 176.5 MMcfd.

The plan calls for an investment of about $300 million, which will come from state loans and foreign governments and banks.

Shanghai expects to invest 3 billion yuan to promote utilization of domestic natural gas.

The East China Sea may prove to be the next area of joint venture participation with foreign oil companies.

Previously reserved for the Ministry of Geology and Mineral Resources, exploration in the East China Sea also will be undertaken by Cnooc, reports China Features' Qi Daqing.

The ministry began seismic surveys in the region in 1974 and spudded the first well in 1985. Of 16 exploratory wells drilled, eight have yielded commercial oil or gas and six hydrocarbon shows, Qi wrote.

The ministry continues to operate a seismic vessel built in the U.K. and outfitted in the U.S. to conduct 2-D and 3-D surveys in the East China Sea. The ministry drilled another three appraisals in the area in 1990. Plans call for preliminary development of Pinghu oil and gas field during 1991-95 with full scale development slated for 1996-2000, Qi wrote.

## South China Sea

Exploratory drilling in the South China Sea slumped from the brisk pace of the early 1980s, but two multinational companies showed fresh interest in the area, and several key fields in the Pearl River estuary were expected to begin producing in 1991.

BP Exploration China and Norway's Den norske stats oljeselskap AS expressed a renewed interest in the South China Sea, south of Guangzhou, and in an area to the west, south of Hainan Island.

By 1995 South China Sea production is expected to reach 120,000 b/d, making it the country's top offshore crude producing area and sixth largest overall.

Chinese and foreign companies conducted 64,581 line km of seismic surveys in the area, found 19 fields, and drilled 86 wells, of which 25 yielded oil.

At least five oil fields are expected to begin producing in 1991-95.

Although plagued with technological problems, Liuhua 11-1 field is considered the most exciting discovery in the area. Oil in place is pegged at 700 million to 1.4 billion bbl, making it the largest producing complex off China, Xu wrote. China signed a contract with Amoco Orient Petroleum Co. to jointly develop the field, expected on stream in 1992 with initial production of 6,100 b/d from six wells.

Huizhou 26-1, a 1988 discovery by ACT Group, was put on stream in late 1991. Original oil in place is estimated at 150 million bbl.

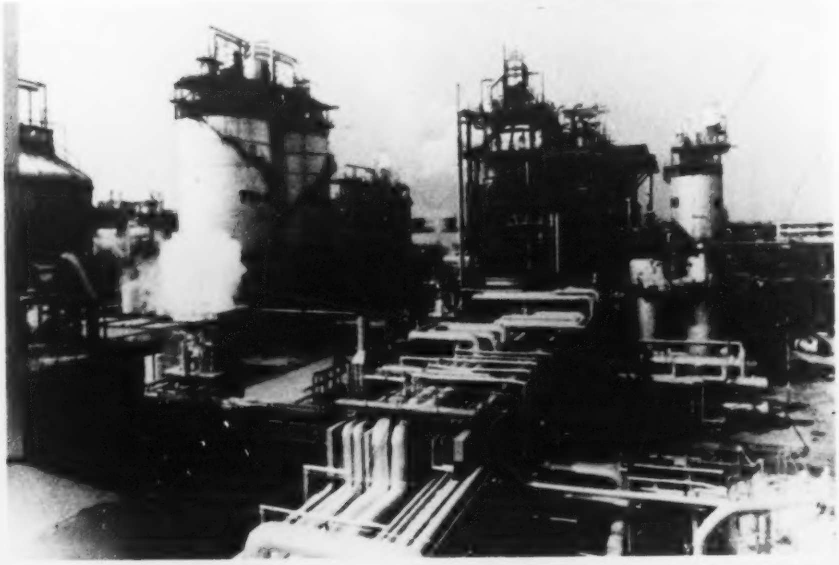
Production facilities have been installed in the area near Huizhou 26-1 and an earlier discovery, Huizhou 21-1, that include a platform for primary gas-liquid separation, a floating production/storage tanker, and a turret moored loading buoy. Production from the 39 million bbl Huizhou 21-1 was expected to peak in 1991 at 'about 29,000 b/d.

Development of Huizhou in 1988-89 entailed drilling 15 wells through a seabed template installed in 381 ft of water. It produces from 10 wells tapping six sands at 2,800-3,000 m. Another four wells are water injectors.

Combined peak production of the two fields is projected at 80,000 b/d in 1992.

Another discovery, ACT's Huizhou 32-2-1, just 10 km from Huizhou 26-1, may be tied back to those other Huizhou production facilities.

It flowed 15,000 b/d in 1991.



*Oxygenating unit in the No. 2 polyester plant at the Shanghai petrochemical complex. The complex is poised for a significant expansion of exports. Photo by China Features.*

**Shanghai petrochemical complex**

| Unit | Capacity (1,000 metric tons/year) |
|---|---|
| **Phase 1, 1972-76** | |
| Atmosperhic/vacuum distillation | 2,800 |
| Ethylene | 115 |
| Acetaldehyde | 30 |
| Acrylonitrile | 50 |
| Acetic acid | 35 |
| Paraxylene | 17 |
| Polyvinyl alcohol (PVA) | 33 |
| Formaldehyde | 15 |
| Low density polyethylene | 60 |
| Polyacrylonitrile | 50 |
| Polyester | 25 |
| PVA blending | 30 |
| LDPE film | 14 |
| Polyacrylic blending | 50 |
| Polyester blending | 11 |

| Unit | Capacity (1,000 metric tons/year) |
|---|---|
| **Phase 2, 1980-86** | |
| Hydrocracking | 900 |
| Hydrogen | 43 |
| Platformer | 400 |
| Paraxylene | 150 |
| Terephthalic acid | 225 |
| Polyester | 200 |
| Polyester blending | 100 |
| **Phase 3, 1987-92** | |
| Atmospheric/vacuum distillation | 2,500 |
| Ethylene | 300 |
| Ethylene glycol | 120 |
| Polypropylene | 140 |
| LDPE | 80 |

when it developed 20,000 and 10,000 ton/year ethylene cracking furnaces designed by Chinese engineers. Sinopec said the units show that China has the ability to design, build, install, and operate large ethylene cracking furnaces. A catalytic pyrolysis unit, which mainly makes propylene, was developed by the company and tested in 1990.

"It is a breakthrough in the conventional technology of high temperature steam cracking, opening a new path for producing olefins," Sinopec said.

"These achievements, together with the technology of long residuum catalytic cracking and mild hydrocracking developed and commercialized in earlier years, mark the stepping up of China's petroleum refining and petrochemical technology to a new high level."

Its recent work building new production units and improving existing heavy oil catalytic cracking, hydrocracking, coking, and visbreaking units allowed the company to increase bottoms upgrading capacity 60% and the yield of light oil products by 5% compared with 6 years ago.

Production of 90 octane and higher gasoline accounted for 35% of all gasoline produced in 1990 in China. Sinopec says it reached that level by building and reconfiguring a number of catalytic reforming, alkylation, methyl tertiary butyl ether, and other units.

Production of high and medium grade lube oil was increased, totaling 57% of all China's lube products manufactured last year.

And Sinopec's capacity to produce polypropylene from refinery gas reached 300,000 tons/year during 1990.

### Large refinery studied

France's Ste. Nationale Elf Aquitaine and partners will step up the pace of feasibility studies for construction of a large refinery in the Padong area, near Shanghai, China.

The action followed a visit to China by Elf Pres. Loik Le Floch-Prigent.

Studies were in a very early stage in partnership with China's Sinopec and others.

Elf, meantime, signed a trade agreement with National Chemicals Import & Export Corp. (Sinochem) calling for a 3 year, $1 billion exchange of crude oil, petroleum products, chemicals, and pharmaceutical raw material.

Construction of the joint venture refinery under study could make Elf the second western company to enter China's refining operations.

France's Total acquired a 20% interest in a joint venture to build a 100,000 b/d export refinery at Dalian, Liaoning province, based on Middle East feedstock.

Elsewhere in China's downstream sector, Royal Dutch/Shell agreed with five Chinese partners to conduct a feasibility study for construction of a $2.5 billion refining and petrochemical complex at Aotou, Guangdong.

### Qinghai-Tibet plateau refinery

Golmud oil refinery on the Qinghai-Tibet plateau in western China is under construction and is to be fully on stream by mid-1995.

The $88 million, 20,000 b/d refinery will produce about 8,200 b/d of gasoline, 6,750 b/d of diesel fuel, 100 b/d of kerosine, 726 b/d of liquefied petroleum gas, and 23,400 tons/year of propylene.

### Kuwaiti business

China was pushing hard for a share of Kuwaiti business meet 41% of domestic demand, reported Iqbal Haidari in Economic Review, a monthly Karachi publication.

Pakistan oil reserves have shot up dramatically in recent years, to about 108.91 million bbl in 1989 from 17.1 million bbl in 1988, Haidari wrote. Oil & Gas Journal estimated Pakistan's oil reserves at 162 million bbl as of Jan. 1, 1991, up from about 118 million bbl on Jan. 1, 1990.

In addition, natural gas now meets 35% of Pakistan's energy needs with production at 1.4 bcfd, Haidari said.

Key to that effort being sustained is Pakistan's campaign to attract more foreign operators through sweetened terms and pared bureaucratic red tape. Economic Review also reported efforts to improve the country's oil and gas infrastructure, notably refining.

Pakistan's crude and refined products import bill in fiscal 1990-91 is expected to total $1.16 billion. Almost one fourth of the country's foreign exchange earnings are spent on crude and products. In 1981, oil imports accounted for only 10% of Pakistan's foreign exchange earnings. If present energy consumption trends continue, in 5 years Pakistan could be spending more than half its total foreign exchange earnings on crude and products imports, Economic Review said.

### Foreign participation

Haidari said an area of 193,700 sq km is under exploration by 29 foreign and local companies with 42 concessions granted in 1988-90 alone.

Principal foreign operators include BP Exploration, British Gas plc, Albion International Resources Inc., Austria's state owned OMV AG, and the local subsidiaries of Texaco Inc., Amoco Corp., Occidental Petroleum Corp., and Unocal Corp.

Pakistan's main oil producing fields are Dhurnal—the biggest—Chak Naurang, Meyal, Fimkassar, Leghari, and Thara.

Chief producing gas fields are Sui, Mari, Meyal, Pirkoh, Toot, Dhurnal, Kandhkot Golrachi, Turk, Loti, Mazari, and Matli. Most Pakistani gas fields are in southern Baluchistan province bordering Iran.

### World Bank loan

The World Bank has agreed to provide Pakistan a $90 million loan for OGDC exploration, development, and related infrastructure work.

It is expected that an additional $50 million will come from the bank through cofinancing.

The Pakistan government will contribute $20 million for the program, putting total cost at $160 million.

The World Bank program calls for development of Dhodak gas field with two development wells, installation of a gas processing plant, construction of a gas pipeline from Dhodak to Kot Addu to back out fuel oil at the power plant there, and installation of a tank farm for condensate at Dhodak.

In addition, the World Bank program will support exploration and appraisal work in nine current joint ventures for which the Pakistan government and OGDC have continuing commitments.

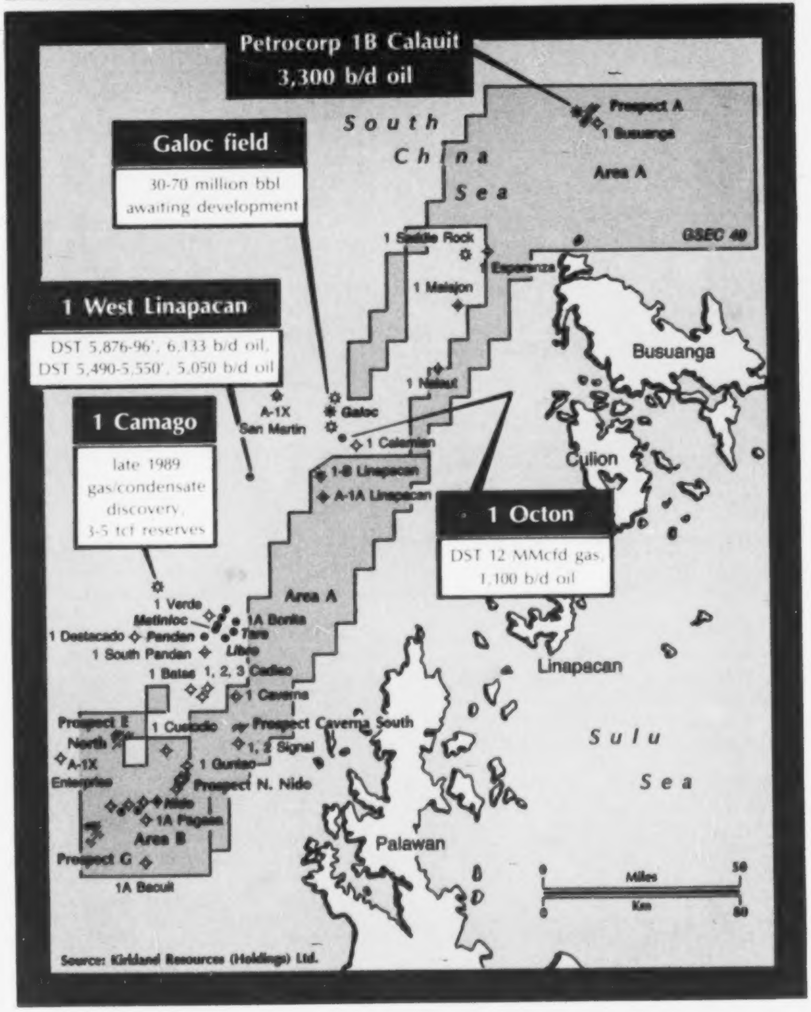
OGDC also entered joint ventures with oil companies in Pothar Sanghar and other prospective areas.

### Sweetened terms, reforms

One key to the stepped up foreign presence is an amended income tax law that makes it easier to recover dry hole costs.

Haidari wrote of other government efforts to boost oil and gas activity in Pakistan that include:

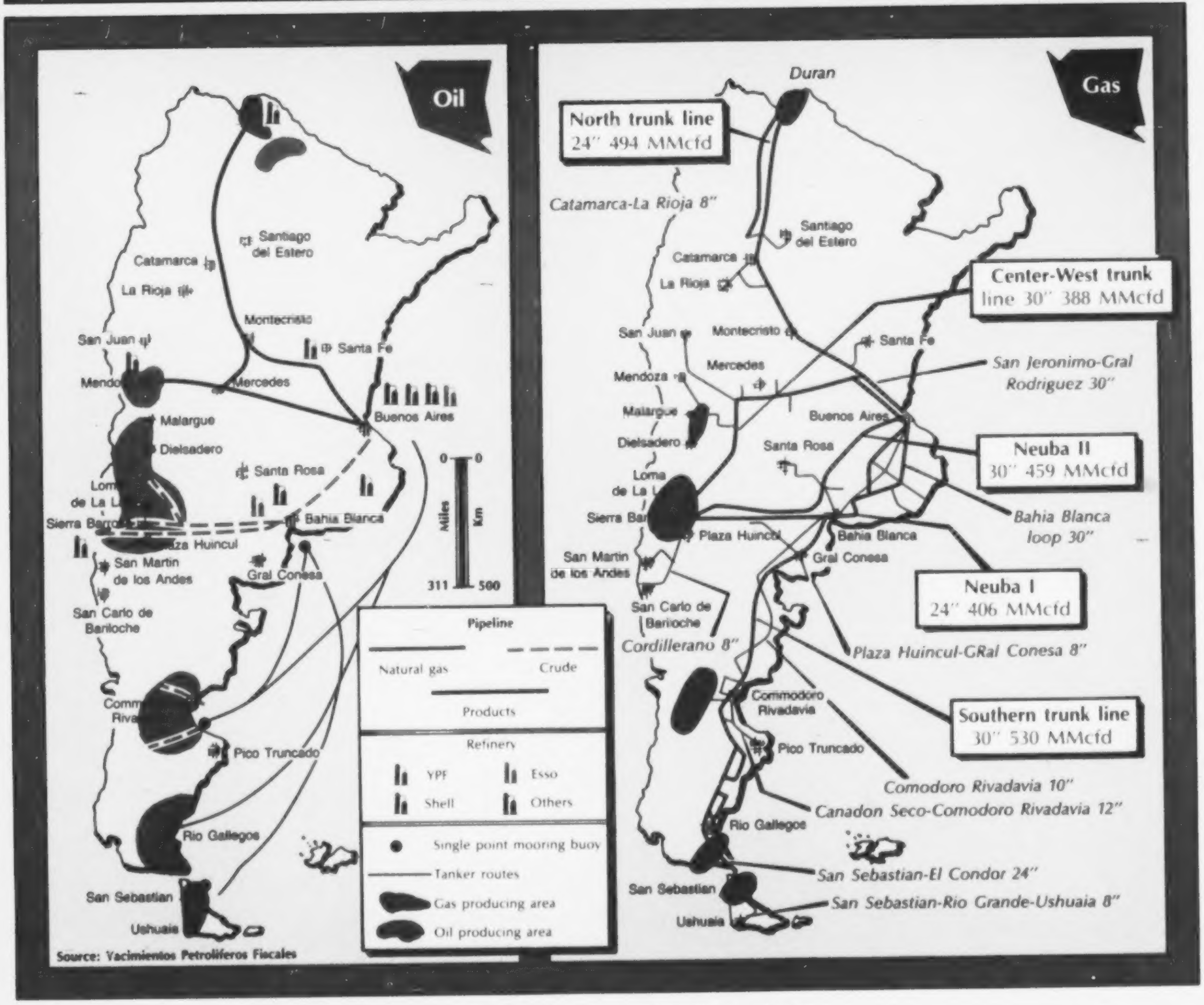
- Expediting oil exploration in Baluchistan province.
- Accelerating processing and final approval of pending and new applications for exploration licenses.
- Increasing refining capacity.
- Laying pipelines from Badin and Sanghar oil fields in Sind province to ensure stable, cheaper transportation.



Petrocorp 1B Calauit
3,300 b/d oil
Galoc field
30-70 million bbl awaiting development
1 West Linapacan
DST 5,876-96', 6,133 b/d oil, DST 5,490-5,550', 5,050 b/d oil
1 Camago
late 1989 gas/condensate discovery, 3-5 tcf reserves
1 Octon
DST 12 MMcfd gas, 1,100 b/d oil
South China Sea
Prospect A
1 Busuanga
Area A
GSEC 49
1 Saddle Rock
1 Esperanza
1 Malajon
1 Nalaut
Busuanga
A-1X San Martin
Galoc
1 Calamian
1-B Linapacan
A-1A Linapacan
Culion
1 Verde
Matinloc
1A Bonita
1 Destacado
Pandan
Tara
1 South Pandan
Libro
1 Batas
1, 2, 3 Cadlao
1 Caverna
Prospect E
North
1 Custodio
Prospect Caverna South
A-1X Enterprise
1, 2 Signal
1 Guntao
Prospect N. Nido
Nido
1A Pagasa
Area B
Prospect G
1A Bacuit
Linapacan
Sulu Sea
Palawan
0 Miles 50
0 Km 80

Source: Kirkland Resources (Holdings) Ltd.

## The petroleum infrastructure in Argentina


Oil
Catamarca
La Rioja
Santiago del Estero
Montecristo
San Juan
Santa Fe
Mendoza
Mercedes
Buenos Aires
Malargue
Dielsadero
Santa Rosa
Loma de La Lata
Sierra Barrosa
Plaza Huincul
Bahia Blanca
San Martin de los Andes
Gral Conesa
San Carlo de Bariloche
Comodoro Rivadavia
Pico Truncado
Rio Gallegos
San Sebastian
Ushuaia
Miles
Km
0
0
311
500
Pipeline
Natural gas
Crude
Products
Refinery
YPF
Esso
Shell
Others
Single point mooring buoy
Tanker routes
Gas producing area
Oil producing area
Gas
Duran
North trunk line
24" 494 MMcfd
Catamarca-La Rioja 8"
Santiago del Estero
Catamarca
La Rioja
Center-West trunk line 30" 388 MMcfd
San Juan
Montecristo
Santa Fe
Mercedes
San Jeronimo-Gral Rodriguez 30"
Mendoza
Malargue
Buenos Aires
Dielsadero
Santa Rosa
Neuba II
30" 459 MMcfd
Loma de La Lata
Sierra Barrosa
Bahia Blanca loop 30"
Plaza Huincul
Bahia Blanca
Gral Conesa
San Martin de los Andes
Neuba I
24" 406 MMcfd
San Carlo de Bariloche
Cordillerano 8"
Plaza Huincul-GRal Conesa 8"
Commodoro Rivadavia
Southern trunk line
30" 530 MMcfd
Pico Truncado
Comodoro Rivadavia 10"
Canadon Seco-Comodoro Rivadavia 12"
Rio Gallegos
San Sebastian-El Condor 24"
San Sebastian
San Sebastian-Rio Grande-Ushuaia 8"
Ushuaia

Source: Vacimientos Petroliferos Fiscales

Peten basin and the Yucatan platform. Its Lower Cretaceous carbonate-evaporite sequence is a direct equivalent to the section of Reforma-Chiapas in Mexico and the Guatemalan Peten oil horizons. What's more, the company said, the presence of several oil seeps, live oil shows in the Cretaceous section of most wells, and subcommercial testing of 30-40° gravity oil in wells in the Belmopan area prove that oil has been generated in the northern Belize basin.

The Nortex license lies on a postulated carbonate-evaporite platform margin with more than 7,000 ft of sedimentary section that has porosity as great as 20-25% in some thick dolomitic intervals capped by anhydrite, particularly in the western part of the block.

Nortex said many live oil shows as well as some gas shows have been recorded in several wells drilled in the vicinity of its license area, and part of the Nortex block lies updip from those wells.

Organic rich marine shales of Jurassic-Lower Cretaceous age, similar to those in Guatemala and Mexico, have been found basinward in Northwest Belize, where they appear to have reached maturity. Nortex considers those shales, interbedded in the evaporite section, the most likely source for oil in Belize.

Traps would be structural and stratigraphic.

Nortex blames the region's lack of discoveries on earlier poor seismic coverage and poor data quality due to near surface velocity variations and bad density contrast in the sedimentary section. But, it said, recent seismic surveys in other parts of the basin with similar problems have yielded much better seismic definition of the structural setting.

## BOLIVIA

CAPITAL: La Paz
MONETARY UNIT: Boliviano
REFINING CAPACITY: 45,250 b/cd
PRODUCTION: 22,300 b/d
RESERVES: 119 million bbl

Activity in Bolivia in 1991

● A joint venture of Diamond Shamrock Inc. and Sol Petroleo SA, Buenos Aires, completed the purchase of Occidental Petroleum Corp.'s and CanOxy's jointly held exploration and production interests in Bolivia.

# Ecuador's oil sector at a glance

**Oil history**
Oil seeps were identified on Ecuador's Santa Elena peninsula in the pre-Columbian era. Indians recovered oil for fuel from hand dug pits in seeps, as did Spanish conquistadors for boiling down to pitch for caulking boats. First modern discovery: Anglo-Ecuadorian Oilfields Ltd. 1 Ancon flowed small volume of oil from Eocene pay at 1,500 ft in 1912. Commercial production established in 1917, limited to Santa Elena peninsula. Santa Elena refineries processed a mix of domestic crude and imported feedstocks, shipping gasoline and diesel by tanker to Guayaquil, then via rail to Quito. Frequent flooding of Guayaquil-Quito railway often knocked out fuel supplies to half the country. In 1967-71, following award of concessions to foreign oil companies, there was a series of discoveries in the Oriente basin of Ecuador's eastern Amazon jungles: Lago Agrio 1967, Aguarico, Sacha, and Shushufindi 1969, and Auca 1971. Construction of Trans-Ecuadorian pipeline linking Oriente fields to the crude export terminal at Balao on the Pacific coast completed in August 1972, making Ecuador a sizable oil exporter. Corp. Estatal Petrolera Ecuatoriana formed in 1972 as a result of new oil laws that led all foreign oil companies except Texaco, Gulf, and City Investing Co. to withdraw from Ecuador. Ecuador joined OPEC in November 1973. CEPE's first project was a small products pipeline from Guayaquil to Quito. CEPE in 1974 acquired 25% of Texaco-Gulf combine operating Oriente fields—a concession dating to 1964—then Gulf's remaining 35.5% stake in 1977, giving it a 62.5% majority stake in the venture. In 1977, CEPE built the 55,000 b/d Esmeraldas refinery to process Oriente crude. CEPE then laid a pipeline to move gasoline and diesel from Esmeraldas to Quito, mothballed the Guayaquil products line, installed storage and distribution facilities in Quito, and laid a products line to Ambato. In addition, CEPE installed a gas processing plant at Shushufindi and a pipeline to move LPG to Quito. Lagging production replacement spurred government to pass new law in 1982 allowing foreign oil companies to undertake exploration under risk/service contracts.

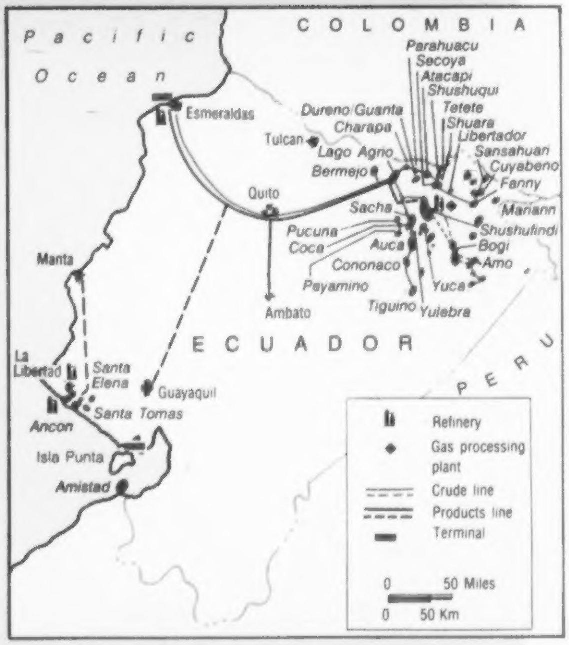
**Petroecuador**
Holding company successor to CEPE as of September 1989. Permanent affiliates Petroproduccion, Petroindustrial, and Petrocomercial; temporary affiliates Petroamazonas, Petrotransporte, and Petropeninsula to be merged later into related permanent affiliates. Petroproduccion manages exploration and production, Petroindustrial refining, and Petrocomercial marketing. Petroamazonas replaced Texaco as operator for group in Oriente fields, Petrotransporte operates Lago Agrio-Balao pipeline, and Petropeninsula operates Anglo and Repetrol refineries on Santa Elena peninsula.

**MAJOR FIELDS**

| Field | Depth, ft | No. of wells Producing | No. of wells Total | production b/d | °API gravity |
|---|---|---|---|---|---|
| Ancon | 4,000 | 439 | 439 | 652 | 35.7 |
| Atacapi | 9,855 | 4 | 5 | 1,505 | 31.0 |
| Auca | 10,578 | 23 | 24 | 15,701 | 28.0 |
| Auca Sur | 9,100-10,300 | 2 | 2 | 614 | 25.6 |
| Bermejo | 5,000 | 21 | 26 | 5,475 | 32.5 |
| Carpet | — | 99 | 99 | 124 | 36.4 |
| Cautivo | — | 79 | 79 | 112 | 36.4 |
| Charapa | 10,000 | 1 | 4 | 291 | 29.5 |
| Cononaco | 11,233 | 9 | 11 | 12,785 | 33.3 |
| Culebra | 10,626 | 2 | 2 | 1,125 | 17.5 |
| Cuyabeno | 8,050 | 15 | 19 | 7,872 | 27.4 |
| Dureno/ Guanta | 9,575-10,290 | 10 | 10 | 7,883 | 31.0 |
| Fanny | 7,700 | 8 | 8 | 4,685 | 22.5 |
| Lago Agrio | 10,175 | 18 | 24 | 8,738 | 28.5 |
| Libertador | N/A | 44 | 50 | 37,306 | 29.7 |
| Mariann | 7,700 | 5 | 5 | 1,048 | 20.0 |
| Parahuacu | 10,173 | 3 | 5 | 1,607 | 30.0 |
| Rumiyacu | 10,191 | — | 1 | — | 21.0 |
| Sacha | 10,160 | 96 | 103 | 63,613 | 28.0 |
| Shushufindi | 9,772 | 52 | 60 | 100,953 | 30.0 |
| Tarapoa | 8,300 | 1 | 2 | 333 | 20.0 |
| Tetete | 9,300 | 6 | 11 | 2,738 | 29.1 |
| Yuca | 10,423 | 6 | 7 | 2,681 | 28.0 |
| Yuca Sur | 9,600-10,000 | 1 | 1 | 351 | 14.5 |
| Yulebra | 8,800-10,000 | 3 | 3 | 1,753 | 21.4 |

**1990 production** 286,918 b/d
**Productive capacity** 311,000 b/d (3rd quarter 1991 estimate)
**1990 production breakout** (b/d)
Petroecuador-Texaco 216,965
Petroproduccion (Oriente) 63,900
Petroecuador-City Investing 5,110
Petroproduccion (Santa Elena) 943

**1990 field start-ups** (b/d)
Pucuna 5,000
Tiguino 3,000
Coca-Payamino 1,700*
*Initial production in early 1991, to reach 11,000 b/d by yearend 1991.



**1990 OPEC quota** 275,000 b/d
**1991 OPEC quota** 273,000 b/d
**Estimated reserves, 1-1-91** Crude, 1.42 billion bbl Gas, 3.95 tcf
**Projected 1991 export crude value** $17/bbl
**Oil minister** Donald Castillo

**GAS PROCESSING**

|  | Gas capacity (MMcfd) | Gas throughput (MMcfd) | Production: Normal or unsplit butane (1,000 gal/day) | Production: Debut. nat. gasoline (1,000 gal/day) |
|---|---|---|---|---|
| Ancon/Santa Elena | 16.0 | 5.5 | 1.1 | 5.6 |
| Shushufindi | 25.0 | 15.0 | 96.0 | 31.7 |

**REFINING***

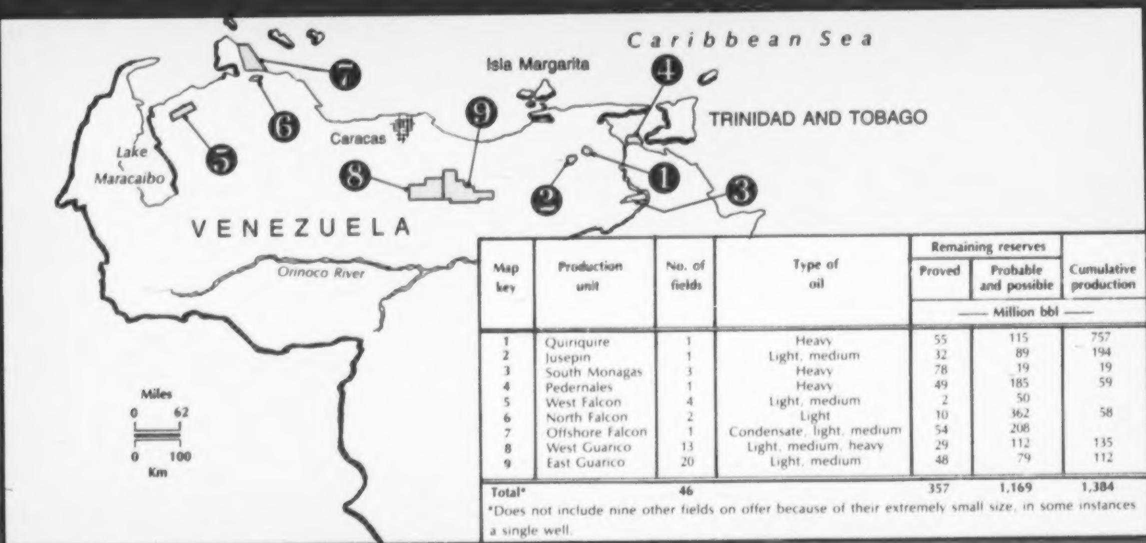
|  | Capacity 1-1-91, b/cd: Crude | Vacuum distillation | Thermal operations | Catalytic cracking | Catalytic reforming |
|---|---|---|---|---|---|
| Esmeraldas | 90,000 | 43,020 | 25,200 | 16,000 | 2,780 |
| Santa Elena/ Anglo | 32,300 | — | — | — | — |
| Amazonas | 10,000 | — | — | — | — |
| Santa Elena/ Repetrol | 8,500 | — | — | — | — |

*Also a 1,000 b/d topping plant Texaco operates in Lago Agrio field.

**PETROCHEMICALS**
Cia. Quimica Borden Ecuatoriana SA's processes methanol to produce 9,200 metric tons/year of formaldehyde, UF resins, vinyl acetate emulsions, plasticizers, and consumer products. Plastigama SA produces polyethylene and PVC pipe, plastic films, and polyethylene rope at Guayaquil.

**TRANSPORTATION**
Trans-Ecuadorian trunk line, 503 km long and 300,000 b/d capacity, moves Oriente oil to Esmeraldas for refinery or export. A 28 km spur to Colombia's Trans-Andean line was built as alternative export route after March 1987 earthquake almost wiped out Ecuador's crude exports for months. Shushufindi-Quito products line, 304 km and 7,300 capacity, moves LPG from Oriente gas processing plant. Products system, 259 km and 58,000 b/d, moves products from Esmeraldas to Quito then via a 111 km spur to Ambato. An 18 km line moves Santa Elena refined products from a marine terminal at Tres Bocas to storage at Pascuales, near Guayaquil. Total crude and products storage capacity in the country is 1.7 million bbl. Three single point mooring terminals at Balao can handle 100,000 dwt tankers. A fuel oil export terminal at Tepre, near Balao, can handle 25,000 dwt vessels. Crude and products exports are under the auspices of Flota Petrolera Ecuatoriana, LPG shipments by Liquigas, Duragas, Congas, and Autogas.

## Where Venezuela plans to reactivate oil fields



| Map key | Production unit | No. of fields | Type of oil | Remaining reserves: Proved | Remaining reserves: Probable and possible | Cumulative production |
|---|---|---|---|---|---|---|
| | | | | — Million bbl — | | |
| 1 | Quiriquire | 1 | Heavy | 55 | 115 | 757 |
| 2 | Jusepin | 1 | Light, medium | 32 | 89 | 194 |
| 3 | South Monagas | 3 | Heavy | 78 | 19 | 19 |
| 4 | Pedernales | 1 | Heavy | 49 | 185 | 59 |
| 5 | West Falcon | 4 | Light, medium | 2 | 50 | |
| 6 | North Falcon | 2 | Light | 10 | 362 | 58 |
| 7 | Offshore Falcon | 1 | Condensate, light, medium | 54 | 208 | |
| 8 | West Guarico | 13 | Light, medium, heavy | 29 | 112 | 135 |
| 9 | East Guarico | 20 | Light, medium | 48 | 79 | 112 |
| Total* | | 46 | | 357 | 1,169 | 1,384 |

*Does not include nine other fields on offer because of their extremely small size, in some instances a single well.

Linchpin of that effort is a planned $48 billion investment program for 1991-96 that among other things would have sharply increased Venezuela's output of crude oil and refined products and petrochemicals for export.

What also may be threatened is the momentum toward privatization and increased foreign investment in Venezuela's petroleum sector that was to accompany that expansion program.

The order requires the minister of energy or a shareholders assembly in which the government as single shareholder is represented by the minister of energy to grant prior approval to any decisions in four major areas:

- Establishment, merger, modification, or liquidation of any companies in or outside Venezuela in which Pdvsa has an equity interest.
- Contracting of any financial obligations to be used for investments, acquisition of assets, or expenses not included in Pdvsa's annual budget.
- Changes in wages or benefits of oil industry employees.
- Naming of top executives.

The new rule covers not only Pdvsa but all subsidiaries and companies in which it is an equity partner.

### Maraven's Cardon plans

Maraven SA, an operating unit of Pdvsa, planned outlays totaling $1.8 billion for four projects at its Cardon refinery on the Paraguana Peninsula in western Venezuela.

The investments, to be made the next 5 years, are intended to hike the refinery's capacity to process heavy crudes, produce a slate of higher quality products for export, and meet new environmental rules for refined products in the U.S., the most important foreign market for Venezuelan petroleum exports. The Cardon projects are a:

- 60,000 b/d delayed coker scheduled to go on stream at the end of 1994.
- 15,000 b/d hydroprocess unit slated to start up in early 1996. It will use the HDH (hydrogenation and hydroconversion) process developed by Pdvsa's research arm Intevep.
- 45,000 b/d capacity naphtha reformer, to begin operation at yearend 1994. Once this unit is working, it will allow Maraven and affiliate Pequiven to later build an aromatics plant at Cardon.
- 15,000 b/d isomerization unit, to start up at the end of 1994, to boost gasoline octane levels.

### Petrochemical plans

Pequiven estimated investments for Venezuela's petrochemical sector would reach $1.3 billion in 1991.

Hugo Finol, the president of Pequiven, said his company would make direct investments of $820 million in 1991, while private sector companies from Venezuela and overseas were scheduled to invest an additional $480 million in joint venture projects.

### 1991 spending goals

Pdvsa planned to invest a total of 250 billion bolivars ($5 billion U.S.) in 1991 for exploration, production, refining, transportation, petrochemicals, domestic marketing, and coal. This was the largest amount invested by the Venezuelan petroleum industry in a single year and forms part of a $34 billion investment in 1991-96.

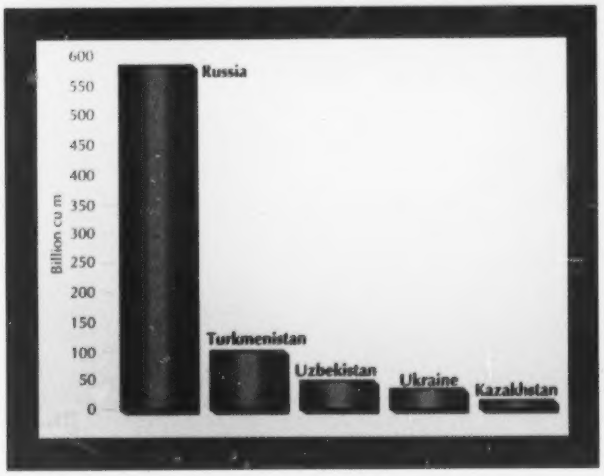
Pdvsa also expected to invest $860 million in U.S. and European refineries where it is owner or a partner.

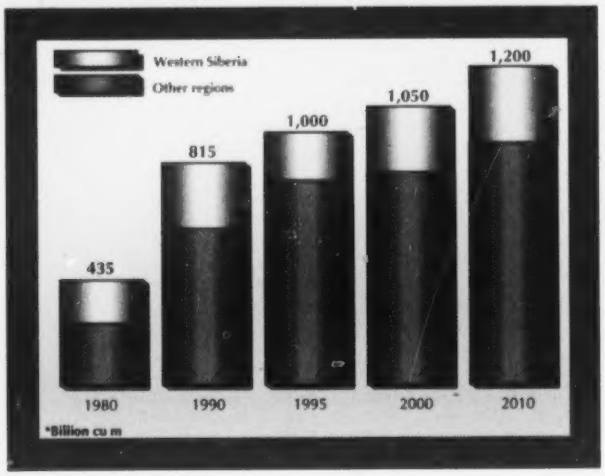
Pdvsa's main targets for 1991 were crude production of 2.5 million b/d and export revenues of $16.5 billion, working out as an export volume of 1.9 million b/d at about $20/bbl.

The company planned to maintain its proved reserves of crude oil in 1991 at 58.9 billion bbl, about the same as in 1990. Proved natural gas reserves were expected to reach 21 billion bbl of oil equivalent by yearend.

Other targets for 1991 were crude productive capacity of 2.97 million b/d—up from 2.75 million b/d—Orimulsion production of 34,000 b/d, average refining runs of 1.04 million b/d at Venezuela's six refineries and 195,000 b/d at the unit Pdvsa leases in Curacao.

Maraven planned to drill nine wildcats in 1991 and 352 delineation and development wells and conduct 313 workovers. Work was to be concentrated in western Venezuela.





discovered reserves are in the Vendian-Lower Cambrian rocks and more than 35% of the reserves are confined to Mesozoic complexes developed on platform margins.

It is also noteworthy that in the U.S.S.R., as compared with other countries, ancient rock/stratigraphic units are characterized by rather high productivity.

Deep horizons within the U.S.S.R. are not sufficiently explored, the minister said. Only 5% of all discovered oil and 12% of all gas reserves are at depths exceeding 3 km.

The portion of hydrocarbon reserves in nonconventional traps is small: Stratigraphic and lithologic traps contain 17% of oil and 6.7% of gas reserves; reefs contain 2.5% of oil and 5% of gas discovered reserves.

Carbonate reservoirs in the Soviet Union contain only 8% of the oil reserves and 17% of gas reserves (30% of all discovered pools are in carbonates). This is one-half to one-third the share of reserves in carbonates evident in other countries. Carbonates nevertheless are widely spread over the U.S.S.R., particularly in the Pre-Caspian, Timan-Pechora, Volga-Ural, Amudarya, and Leno-Tungussk provinces.

In most of the U.S.S.R., potential oil and gas resources have been explored to depths of 3.5-4 km.

## Soviet pipeline construction shows decline

The U.S.S.R.'s long pipeline construction boom has fallen victim to Moscow's severe shortage of funds and the nation's overall petroleum industry decline.

Soviet crews probably will lay fewer large diameter trunk lines during the early 1990s than at any time since the 1960s. That is in sharp contrast with other parts of the world that are undergoing a surge of pipeline construction sparked by rising demand for natural gas.

With oil production plunging and gas flow showing meager growth, the U.S.S.R. currently has little need for added pipeline capacity to move hydrocarbons from western Siberia, its biggest producing area, across the Ural Mountains to European Russia's industrial and population centers.

Even if Soviet oil and gas consumption were surging and exports to markets in eastern and western Europe were increasing strongly, Soviet pipeline construction probably would have slacked off from the frantic pace set in the 1970s through 1987. Besides the shortage of money for new projects, the U.S.S.R.'s pipe production has dropped sharply along with imports, which have been affected by Moscow's inability to pay for some orders filled by foreign suppliers.

The downturn in U.S.S.R. pipeline building began in 1988, when oil production climbed to record levels and gas flow was continuing to register big gains. Pipe-laying plummeted in 1989 and 1990 and was slated to tumble again during 1991.

Total length of the Soviet pipeline network rose from 200,600 km (124,600 miles) at the end of 1980 to more than 300,000 km (186,300 miles) early in 1990. Length of crude pipelines peaked in 1987, but gas and petroleum products networks have grown slowly during the past several years.

According to official figures, the U.S.S.R. had 35,707 miles of crude oil pipelines at the end of 1980, 42,166 miles at the end of 1987, and 41,172 miles on Jan. 1, 1990. Length of gas pipelines grew from 81,289 miles at the end of 1980 to 132,211 miles by early 1990.

The badly neglected Soviet petroleum products pipeline network increased from 7,576 miles at the end of 1980 to 12,047 miles Jan. 1, 1990.

While the total length of Soviet pipelines jumped by 10,433 miles in 1987, the system gained only 6,396 miles in 1988 and 3,043 miles in 1989. Only 3,664 miles of gas pipeline were completed in 1990 vs. a target of 5,183 miles. Sixteen of the planned 48 compressor stations were placed in service.

During 1991, the U.S.S.R. planned on laying 3,291 miles of gas trunk lines and laterals, according to the official magazine Gazovaya Promyshlenost (Gas Industry). The Soviets again hoped to add 48 compressor stations, most of them being facilities not finished as scheduled in 1990.

Increasing numbers of pipeline construction enterprises operated at a loss in 1990, while housing and other amenities for workers were not provided as promised. Big gas pipeline projects were abruptly shut down for lack of funds, especially in western Siberia, and skilled workers were fired or quit their jobs. Besides the lag in gas pipeline and compressor station construction, completion of gas treatment facilities and additional underground gas storage capacity is far behind government goals.

Best long term prospects for major new Soviet gas pipeline construction may be in eastern Siberia and the Far East. But proposals for building long pipelines tapping reserves found recently in remote areas of eastern Siberia's Yakut Autonomous Republic and in the Sea of Okhotsk off the northeast coast of Sakhalin Island would require huge credits from Japan and South Korea.

First pipeline from giant gas fields on western Siberia's

## Alaska's oil and gas outlook

| Fiscal Year | NGL | Prudhoe | Kuparuk | Milne Point | Endicott | Lisburne | West Sak | North Star | Niakuk | Point McIntyre | Sag Delta | Schrader Bluff | Total ANS | Cook Inlet | State Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Million b/d | | | | | | | | | | | | | | |
| **OIL PRODUCTION OUTLOOK*** | | | | | | | | | | | | | | | |
| 1991 | 0.058 | 1.279 | 0.299 | 0.018 | 0.102 | 0.039 | 0.000 | 0.000 | 0.000 | 0.000 | 0.006 | 0.000 | 1.801 | 0.039 | 1.840 |
| 1992 | 0.061 | 1.254 | 0.303 | 0.018 | 0.104 | 0.036 | 0.000 | 0.000 | 0.000 | 0.000 | 0.005 | 0.005 | 1.787 | 0.041 | 1.828 |
| 1993 | 0.056 | 1.173 | 0.301 | 0.017 | 0.104 | 0.031 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | 0.009 | 1.694 | 0.040 | 1.734 |
| 1994 | 0.053 | 1.115 | 0.301 | 0.017 | 0.099 | 0.025 | 0.000 | 0.000 | 0.000 | 0.054 | 0.002 | 0.010 | 1.676 | 0.039 | 1.715 |
| 1995 | 0.051 | 1.063 | 0.301 | 0.015 | 0.088 | 0.020 | 0.000 | 0.000 | 0.010 | 0.083 | 0.001 | 0.010 | 1.642 | 0.038 | 1.680 |
| 1996 | 0.047 | 0.997 | 0.287 | 0.013 | 0.080 | 0.019 | 0.000 | 0.000 | 0.020 | 0.089 | 0.001 | 0.009 | 1.562 | 0.036 | 1.598 |
| 1997 | 0.044 | 0.917 | 0.253 | 0.011 | 0.068 | 0.018 | 0.000 | 0.000 | 0.021 | 0.089 | 0.001 | 0.008 | 1.429 | 0.035 | 1.464 |
| 1998 | 0.040 | 0.845 | 0.227 | 0.009 | 0.061 | 0.017 | 0.000 | 0.000 | 0.019 | 0.083 | 0.001 | 0.008 | 1.310 | 0.034 | 1.344 |
| 1999 | 0.035 | 0.734 | 0.199 | 0.007 | 0.055 | 0.017 | 0.000 | 0.000 | 0.016 | 0.069 | 0.000 | 0.016 | 1.148 | 0.032 | 1.180 |
| 2000 | 0.031 | 0.648 | 0.179 | 0.006 | 0.046 | 0.016 | 0.000 | 0.000 | 0.013 | 0.057 | 0.000 | 0.019 | 1.015 | 0.031 | 1.046 |
| 2001 | 0.027 | 0.575 | 0.162 | 0.005 | 0.040 | 0.016 | 0.000 | 0.000 | 0.011 | 0.043 | 0.000 | 0.022 | 0.900 | 0.030 | 0.930 |
| 2002 | 0.024 | 0.513 | 0.153 | 0.000 | 0.035 | 0.015 | 0.000 | 0.000 | 0.009 | 0.040 | 0.000 | 0.025 | 0.815 | 0.028 | 0.843 |
| 2003 | 0.021 | 0.451 | 0.141 | 0.000 | 0.030 | 0.015 | 0.000 | 0.000 | 0.010 | 0.036 | 0.000 | 0.023 | 0.727 | 0.027 | 0.754 |
| 2004 | 0.019 | 0.401 | 0.130 | 0.000 | 0.026 | 0.015 | 0.000 | 0.000 | 0.009 | 0.033 | 0.000 | 0.021 | 0.652 | 0.026 | 0.678 |
| 2005 | 0.017 | 0.350 | 0.121 | 0.000 | 0.022 | 0.014 | 0.000 | 0.000 | 0.009 | 0.031 | 0.000 | 0.019 | 0.583 | 0.024 | 0.607 |
| 2006 | 0.014 | 0.297 | 0.112 | 0.000 | 0.019 | 0.013 | 0.000 | 0.000 | 0.009 | 0.027 | 0.000 | 0.018 | 0.508 | 0.023 | 0.531 |
| 2007 | 0.012 | 0.252 | 0.104 | 0.000 | 0.016 | 0.013 | 0.000 | 0.000 | 0.008 | 0.023 | 0.000 | 0.016 | 0.432 | 0.022 | 0.464 |
| 2008 | 0.011 | 0.221 | 0.098 | 0.000 | 0.014 | 0.013 | 0.000 | 0.000 | 0.007 | 0.019 | 0.000 | 0.015 | 0.396 | 0.020 | 0.416 |
| 2009 | 0.009 | 0.198 | 0.089 | 0.000 | 0.007 | 0.012 | 0.000 | 0.000 | 0.006 | 0.016 | 0.000 | 0.013 | 0.351 | 0.019 | 0.370 |
| 2010 | 0.009 | 0.181 | 0.081 | 0.000 | 0.000 | 0.012 | 0.000 | 0.000 | 0.005 | 0.014 | 0.000 | 0.009 | 0.310 | 0.018 | 0.328 |
| 2011 | 0.008 | 0.166 | 0.072 | 0.000 | 0.000 | 0.012 | 0.000 | 0.000 | 0.000 | 0.012 | 0.000 | 0.007 | 0.276 | 0.017 | 0.293 |
| 2012 | 0.008 | 0.157 | 0.066 | 0.000 | 0.000 | 0.011 | 0.000 | 0.000 | 0.000 | 0.010 | 0.000 | 0.005 | 0.257 | 0.016 | 0.273 |
| 2013 | 0.007 | 0.146 | 0.061 | 0.000 | 0.000 | 0.011 | 0.000 | 0.000 | 0.000 | 0.009 | 0.000 | 0.003 | 0.236 | 0.014 | 0.250 |
| 2014 | 0.007 | 0.137 | 0.055 | 0.000 | 0.000 | 0.011 | 0.000 | 0.000 | 0.000 | 0.007 | 0.000 | 0.002 | 0.218 | 0.013 | 0.231 |
| 2015 | 0.006 | 0.126 | 0.049 | 0.000 | 0.000 | 0.011 | 0.000 | 0.000 | 0.000 | 0.006 | 0.000 | 0.001 | 0.199 | 0.013 | 0.211 |

| **REMAINING RESERVES†** | Oil Million bbl Reserves | | | Gas Bcf Reserves | | |
|---|---|---|---|---|---|---|
| | LOW | MID | HIGH | LOW | MID | HIGH |
| **NORTH SLOPE** | | | | | | |
| DEVELOPED | | | | | | |
| East Barrow | – | – | – | 7 | 7 | 7 |
| Endicott | 215 | 280 | 415 | 582 | 782 | 1,182 |
| Kuparuk River Unit | 685 | 885 | 1,085 | 395 | 520 | 670 |
| Lisburne reservoir | 80 | 150 | 350 | 788 | 888 | 988 |
| Milne Point Area | 30 | 50 | 80 | – | – | – |
| Prudhoe Bay Unit | 4,400 | 4,700 | 5,400 | 25,840 | 25,840 | 25,840 |
| South Barrow | – | – | – | 5 | 5 | |
| UNDEVELOPED | | | | | | |
| Beaufort Sea | 0 | 150 | 300 | – | – | – |
| Pt. Thomson/Flaxman Id | 0 | 500 | 300 | 0 | 0 | 5,000 |
| West Sak | 0 | 500 | 3,000 | – | – | – |
| Niakuk | 0 | 50 | 80 | – | – | – |
| Point McIntyre | 150 | 200 | 300 | – | – | – |
| **SUBTOTAL** | **5,560** | **6,965** | **11,310** | **27,617** | **28,042** | **33,692** |
| **COOK INLET** | | | | | | |
| PROVEN AND DEVELOPED | | | | | | |
| Beaver Creek | | 1 | | | 152 | |
| Beluga River | | – | | | 691 | |
| Cannery Loop | | – | | | 148 | |
| Granite Point | | 16 | | | 12 | |
| Ivan River, Lewis River | | – | | | – | |
| Pretty Creek, Stump Lake | | – | | | 499 | |
| Kenai | | – | | | 572 | |
| McArthur River | | 40 | | | 589 | |
| Middle Ground Shoal | | 8 | | | 5 | |
| North Cook Inlet | | – | | | 686 | |
| Swanson River | | 8 | | | 148 | |
| Trading Bay | | 1 | | | 30 | |
| PROVEN BUT UNDEVELOPED OR SHUT-IN | | | | | | |
| Birch Hill | | – | | | 11 | |
| Falls Creek | | – | | | 13 | |
| Nicolai Creek | | – | | | 3 | |
| North Fork | | – | | | 12 | |
| Sterling | | – | | | 23 | |
| West Foreland | | – | | | 20 | |
| West Fork | | – | | | 6 | |
| **SUBTOTAL** | | **74** | | | **3,619** | |
| **STATE TOTAL** | **5,634** | **7,039** | **11,384** | **31,238** | **31,661** | **37,311** |

*Medium case oil price scenario †As of 1-1-90.

Source: Alaska Department of Revenue, Alaska Department of Natural Resources Division of Oil & Gas, Alaska Oil & Gas Conservation Commission

Regional Corp. in early December 1991 appealed a court ruling that the companies must furnish well data from the 1 KIC Jago River wildcat, the only well drilled on the ANWR Coastal Plain, to Alaska's Department of Natural Resources.

In November 1991, the Alaska Supreme Court overturned a lower court ruling barring DNR from reviewing data from the well. As the 1992 IPE went to press, ASRC had filed a motion for reconsideration with the state supreme court. If the court declines, Chevron/BP planned to seek a stay of the order in order to petition the U.S. Supreme Court to hear the case.

The companies want the well data kept proprietary, and DNR wants to review the data to help it evaluate the area's potential and better plan lease sales on nearby state acreage.

The state court ruling dealt only with the issue of whether DNR could review the data, not the larger issue of whether the data could be made public. If the U.S. Supreme Court takes up the case, expectations were that it would hear it by midyear 1992. If not, the DNR then will be allowed to review the data. However, the companies plan to take legal action to block release of the data to the public if DNR opts to do so.

One irony in the controversy: the new head of DNR is Harold Heinze, former president of ARCO Alaska.

## Offshore disappointing

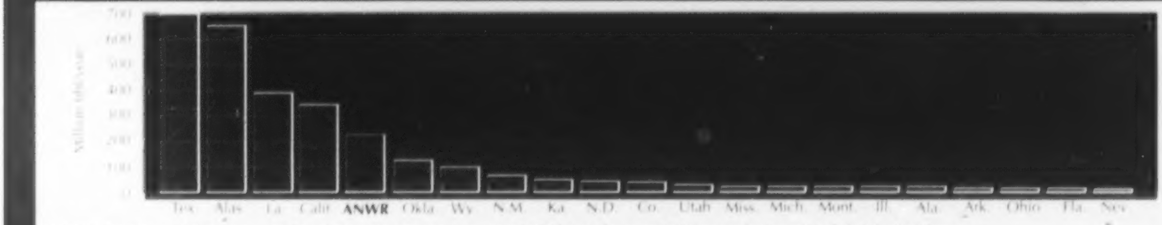
Perhaps almost as keenly disappointing to oil and gas explorationists as the lockup of ANWR has been the lack of success reported to date in Alaska's frontier offshore basins.

Initial seasons in the Chukchi Sea, upon which industry pinned high hopes after the disappoinments of the Gulf of Alaska in the 1970s and Bering Sea in the 1980s, yielded no reports of commercial hydrocarbon discoveries.

That disappointment was reflected in the second Chukchi Sea sale, which turned in the worst performance of any major federal sale of frontier acreage in recent memory.

Chukchi Sea Sale 126 netted a paltry $7.1 million in apparent high bids for 28 tracts that received 30 bids. Only five companies showed up for the sale, exposing about $7.4 million.

That compares with the first Chukchi Sea sale, which drew a record 653 bids for 351 blocks, more than any other sale outside the Gulf of Mexico. Sale 109 garnered more than $478 million in apparent high bids out of $666 million exposed in often spirited bidding. At the time, industry



*ANWR potential production assumes peak production from mean value economic field. State figures reflect 1990 production and include federal offshore.
Sources: Alaska Department of Natural Resources Division of Oil & Gas., Oil & Gas Journal Energy Database

# ANWR debate: How much oil and gas is there?

**Comparing ANWR resource estimates**

| | Billion bbl | | | | | |
|---|---|---|---|---|---|---|
| | Mean | | | 5% chance | | |
| | In place | Recoverable Cond. | Recoverable Uncond. | In place | Recoverable Cond. | Recoverable Uncond. |
| USGS | 13.8 | | | | 29.4 | |
| DOE | 13.8 | 7.51 | 3.45 | 29.4 | 16.00 | 7.35 |
| BLM | 13.8 | 3.57 | 1.69 | 29.4 | 7.60 | 3.26 |
| AAPG | 23.3 | 15.16 | 6.97 | 49.5 | 32.20 | 14.77 |

Debate in 1991 over leasing the Coastal Plain of the Arctic National Wildlife Refuge resurrected some of the same arguments that opponents of leasing have used from the beginning.

The notion that implementing "simple" conservation measures involving insulation or energy saving appliances would obviate the need for ANWR oil is dissected by G. Henry M. Schuler, director of energy studies for the Washington based Center for Strategic and International Studies, in an adjoining commentary.

The other argument, other than environmental concerns, ANWR leasing opponents use is that the region would provide only a minor contribution, about "200 days' supply at current rates of consumption," to the U.S. energy picture.

Industry officials have sharply challenged that notion.

## 'Walloping' ANWR opponents

Sen. Malcolm Wallop (R-Wyo.), ranking minority member of the Senate energy committee and cosponsor with Sen. Bennett Johnston (D-La.) of the 1991 omnibus energy bill, blasted opponents of ANWR leasing after the bill was defeated by filibuster last year.

He criticized the belief of environmentalists and "a cowed Senate" that "a magical conservation silver bullet" will reduce U.S. oil reliance and that the country doesn't additional domestic oil sources.

"No more idiotic concept has gone unchallenged in years than this, because ANWR will provide only 200 days of American oil needs, it is of no help."

government with even tougher standards of their own.

## CAA details

Industry is implementing the first of those mandated composition changes, a rule calling for urban areas not in attainment with CAA goals for carbon monoxide levels to use gasoline containing 2.7 wt % oxygenates beginning Nov. 1, 1992, at least 4 months/year (Fig. 2). Total CO compliance is required for all nonattainment areas by 2000.

Specifically, the average oxygen content of all gasoline sold in the nonattainment areas must be not less tha 2.7 wt %, and each individual gallon of gasoline is required to contain at least 2 wt % oxygen.

But refiner/marketers have had some experience with requirements for higher oxygen levels in gasoline, with seasonal reduced gasoline volatility rules in a number of states and certain urban areas.

Beyond that, refineries, petrochemical plants, and gas processing plants will be forced to spend additional billions of dollars to comply with stationary air emissions provisions of CAA. Those provisions were to take effect Jan. 1, 1992.

CAA also requires EPA to issue a rule within 1 year setting standards for onboard systems to control refueling emissions. Onboard vapor recovery canisters will be required on all passenger vehicles beginning with the fourth year after issuance of standards. Service stations also will be required to install vapor recovery equipment.

In addition, CAA requires tighter tailpipe emissions standards for cars and trucks in phases between 1994 and 1998 and establishes a pilot program in California to promote use of clean fuel vehicle fleets.

Beginning in 1998, fleets of 10 or more vehicles in serious, severe, and extreme ozone nonattainment areas must reduce tailpipe emissions by 80% for cars and 50% for trucks, compared with 1990 levels.

Beginning in 1996, automakers each year must produce 150,000 alternative fuel cars and light trucks for a California pilot program. In 1999 and each year thereafter, 300,000 vehicles are required.

But nothing else approaches the scope of CAA provisions governing reformulated gasoline. CAA calls for reformulated gasoline to be sold in the nine worst ozone nonattainment areas beginning Jan. 1, 1995 (Fig. 3). Ozone nonattainment areas also must reduce volatile organic compounds (VOCs) and air toxics emissions 15% by 1995 and 25% by 2000.

Reformulated gasoline would have levels of VOCs and

Table 1

### Costs of key Clean Air act provisions*

| Provision | Effective date | Cost to industry |
|---|---|---|
| Oxygenated fuels | Nov. 1, 1992 | $670 million/year† |
| Reformulated gasoline | Jan. 1, 1995 | $32 billion |
| Low-sulfur diesel | Oct. 1, 1993 | $3.3 billion |
| Stationary air toxics | Jan. 1, 1992 | $6 billion |

*Estimated. †Manufacturing costs.
Source: Ashland Oil Co.

Table 2

### Incremental cost to produce reformulated gasoline*

| | |
|---|---|
| Fuel volume affected | 5.8 million b/d |
| Incremental manufacturing cost | 10-15¢/gal |
| Total annual cost to consumer | $9-13 billion |

*All 96 ozone nonattainment areas
Source: Ashland Oil Co.

Table 3

### The potential of gas to displace oil

| | Immediate | 1 year | 5 years | 10 years |
|---|---|---|---|---|
| | 1,000 b/d | | | |
| STATIONARY SOURCES | | | | |
| Residential | 5 | 20 | 100 | 225 |
| Commercial | 25 | 100 | 190 | 250 |
| Industrial | 50 | 200 | 400 | 600 |
| Power generation | 50 | 100 | 300 | 400 |
| **Subtotal** | **130** | **420** | **990** | **1,475** |
| MOBILE SOURCES | | | | |
| Vehicles | 0 | 0 | 5 | 240 |
| **Total** | **130** | **420** | **995** | **1,715** |

Source: American Gas Association

Ozone nonattainment areas—1995 reformulated gasoline market

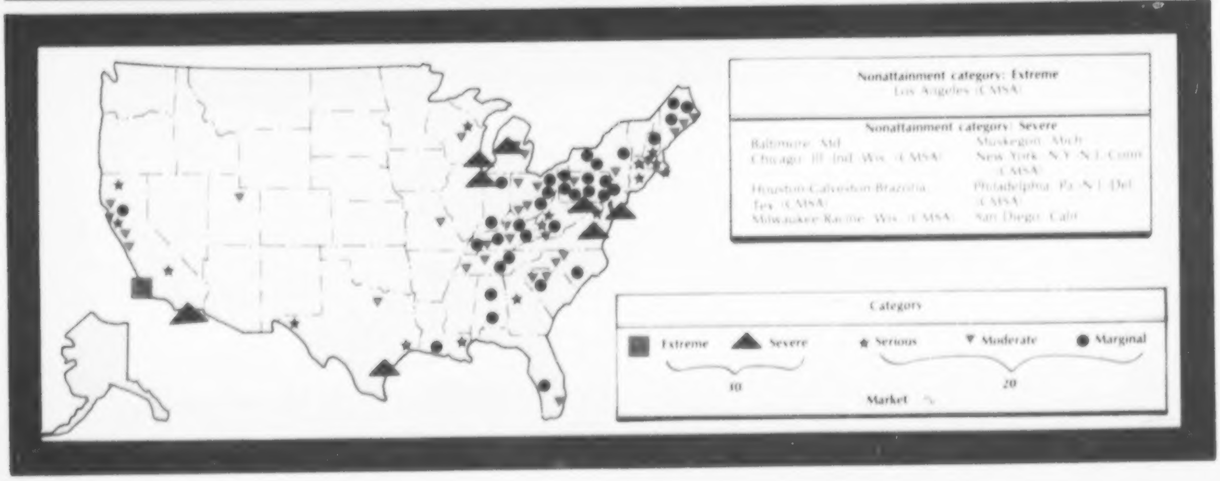

Nonattainment category: Extreme
Los Angeles (CMSA)
Nonattainment category: Severe
Baltimore, Md.
Chicago, Ill.-Ind.-Wis. (CMSA)
Houston-Galveston-Brazoria, Tex. (CMSA)
Milwaukee-Racine, Wis. (CMSA)
Muskegon, Mich.
New York, N.Y.-N.J.-Conn. (CMSA)
Philadelphia, Pa.-N.J.-Del. (CMSA)
San Diego, Calif.
Category
Extreme
Severe
Serious
Moderate
Marginal
10
20
Market, %

Table 5

### U.S. oxygenate supply and demand*

| | Winter 4 mos. b/d | Other 8 mos. b/d | Annual average, b/d |
|---|---|---|---|
| Demand | | | |
| Ethanol (MTBE equivalent) | 128,000 | 128,000 | 128,000 |
| TAME (MTBE equivalent) | 12,000 | 12,000 | 12,000 |
| MTBE | 477,000 | 383,000 | 414,000 |
| **Total** | **617,000** | **523,00** | **554,000** |
| Supply | | | |
| Ethanol (MTBE equivalent) | 128,000 | 128,000 | 128,000 |
| TAME (MTBE equivalent) | 12,000 | 12,000 | 12,000 |
| MTBE | 230,000 | 230,000 | 230,000 |
| **Total** | **370,000** | **370,000** | **370,000** |
| **Shortfall** | **247,000** | **153,000** | **184,000** |

*All 96 ozone nonattainment areas
Source: Ashland Oil Inc.

Table 7

### Summer baseline gasoline vs. the Clean Air Act mandate

| Hydrocarbon type | Baseline gasoline* | CAA mandate† |
|---|---|---|
| Aromatics, vol. % | 32.0 | 25.0 maximum |
| (Benzene)§, vol % | (1.53) | (1.0 maximum) |
| Olefins, vol % | 9.2 | — |
| Saturates, vol % | 58.8 | — |
| Oxygen content, wt % | — | 2.0 minimum¶ |

*EPA will establish winter baseline gasoline specifications. †Will impact approximately 22 vol % U.S. gasoline by Jan. 1, 1995. §Benzene is part of the total aromatics. ¶Approximately 11 vol % MTBE.
Source: George Unzelman, HyOx Inc., after others.

Table 9

### Alternative oxygenate candidates for gasoline

| | Boiling point, °F. | (R+M)/2 octane |
|---|---|---|
| **Alcohols** | | |
| Isopropyl | 180 | 108.5 |
| n-Propyl | 207 | 104 |
| Isobutyl | 225 | — |
| n-Butyl | 244 | 87 |
| **Ethers** | | |
| Diisopropyl | 154 | 104.5 |
| Methyl t-hexyl | — | 89 |
| Methyl phenyl | 309 | 110 |
| Ethyl t-amyl* | 212 | — |
| Isopropyl t-butyl | — | 100.5 |
| **Esters** | | |
| Methyl acetate | 135 | 105 |
| Ethyl acetate | 171 | 105 |
| Isopropyl acetate | 199 | 102 |

*TAME
Source: George Unzelman, HyOx Inc., after others.

Table 6

### Octane and oxygen values for oxygenates

| | Blending octane* | | | Oxygen, wt % |
|---|---|---|---|---|
| Ethers | RON | MON | (R+M)/2 | |
| MTBE | 118 | 100 | 109.0 | 18.2 |
| ETBE | 118 | 102 | 110.0 | 15.7 |
| TAME | 111 | 98 | 104.5 | 15.7 |
| **Alcohols** | | | | |
| Methanol | 133 | 99 | 116.0 | 49.9 |
| Ethanol | 130 | 96 | 113.0 | 34.7 |
| TBA | 109 | 93 | 101.0 | 21.6 |

*All blend values are estimates from average data and vary with hydrocarbon type of gasoline and concentration of oxygenate.
Source: George Unzelman, HyOx Inc., after others.

Table 8

### Physical properties of oxygenates

| | Gravities* | | Boiling point, °F. | Rvp, psi | |
|---|---|---|---|---|---|
| | sp.gr | API | | Actual | Blend |
| **Ethers** | | | | | |
| MTBE | 0.744 | 58 | 131 | 7.8 | 8-10 |
| ETBE† | 0.747 | 58 | 161 | 1.5 | 3-5 |
| TAME | 0.770 | 52 | 187 | 1.5 | 3-5 |
| **Alcohols** | | | | | |
| Methanol§ | 0.796 | 46 | 149 | 4.6 | 50-60 |
| Ethanol† | 0.794 | 46 | 172 | 2.3 | 17-22 |
| TBA | 0.791 | 47 | 181 | 1.8 | 10-15 |

*API gravities are to the nearest degree. †Currently, MTBE and ethanol are the only oxygenates being used in U.S. gasoline in significant quantities. §Methanol must be used with an appropriate cosolvent per EPA waivers.
Source: George Unzelman, HyOx Inc., after others.

Table 10

### How gas processing plant permit costs will jump

| | Current TACB permit fees* | Title V permit fees* |
|---|---|---|
| Initial permit | $10,000 | $ 127,103 |
| Annual permit | ..none.. | $ 127,103 |
| Permit renewal (after 15 years) | $10,000 | $ 127,103 |
| **Total cost over 15 years** | **$20,000** | **$2,033,648** |

*The listed fees do not include any potential inspection fee which may be levied by the air control authority.
Source: ENSR Consulting & Engineering

balance demand with expected supply of oxygenates in CO nonattainment areas for winter 1992-93.

Refinery planners will have to cope with more than just reformulated fuels in CAA implementation. Similar problems will be incurred in CAA provisions covering hazardous air pollutants (HAPs) (Fig. 6, Table 11) and state implementation plans (SIPs) (Fig. 7).

## Gas processing outlook

One clear winner in the CAA debate is the U.S. gas processing industry.

According to Purvin & Gertz Inc., Dallas, the effects of CAA and other clean air legislation will sustain future gas

Table 1

**A grading of East Bloc investment attractiveness***

| | Soviet Union | Bulgaria | Czecho-slovakia | Hungary | Poland | Romania | Yugo-slavia |
|---|---|---|---|---|---|---|---|
| Overall | D+ | D | B | B− | C+ | D | C |
| Economic | C− | C | B+ | B− | C | C− | C− |
| State of the economy | D | C− | A− | B− | C+ | D− | D |
| Reform prospects | C | C+ | A− | A− | B+ | C | C+ |
| Debt burden | B | D | A− | D | C | A | B− |
| Inflation | D | C− | B− | C | D | C | D |
| Access to EC market | C | C | B | B | B | C | B |
| Labor market | C− | C− | A− | B | C | D | C |
| Education/labor skills | C | C− | A | A | B− | D | C |
| Work ethic/discipline | D | C− | B | B− | C− | D | C |
| Market size | A | F | C | D | B | B− | B− |
| Natural resource endowment | A | F | D | F | B | C | C |
| Receptivity to foreign investment | C | C | A− | A | B− | D | B |
| Prospects for profit repatriation | C− | D+ | B | A | A | D | A |
| Foreign aid prospects | D+ | D | C− | B− | B | D− | B− |
| Political prospects | D | D+ | A− | B+ | B− | D− | D |
| Strength of non-Communist parties | C− | D | B | A | B | D | B |
| Political stability | D− | C | A | B | C | D− | F |
| Democratic tradition | F | D | A | B− | C | D− | C− |

*A = outstanding; F = dismal.
Source: PlanEcon

newly emerging democracies that environmental considerations be given a high priority in energy choices.

Movit said it's essential to understand the nature of the political and economic dilemma that forced rapid change in eastern Europe in order to identify near term tasks as well as predicting the kinds of changes ahead in those economies and especially in their energy sectors.

"The Communist political regimes, which had held sway for decades in eastern Europe, had made an implicit social contract with the populace," Movit wrote in the June 3, 1991, Oil & Gas Journal. "In return for a monopoly on political power, the party promised steady improvements in the living standard of the workers.

"By the late 1980s, however, it had become obvious that Stalinist economics was a failure, and instead of providing improvements in the standard of living, the already big gap between East and West was widening. That eventually led to the demise of the ruling party throughout the eastern European nations."

Movit notes that while the successor regimes want to return their countries to economic growth, they are not convinced the only way this can be accomplished is through improved efficiencies inherent in the resurrection of the private sector.

## Central authority involvement disappearing

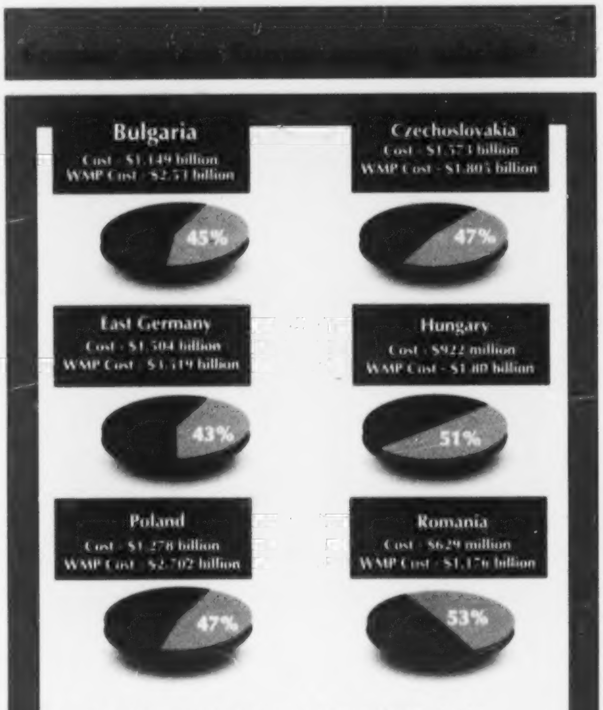
"With economic reforms planned or under way in Czechoslovakia, Poland, Hungary, Romania, and Bulgaria, the bureaucratic links that ensured daily involvement by the central government in production activity are disappearing.

"The regimes are seeking to rationalize their economies by liberalizing the process of price formation, liberalizing trade, and ending the subsidization of inefficient enterprises," Movit wrote.

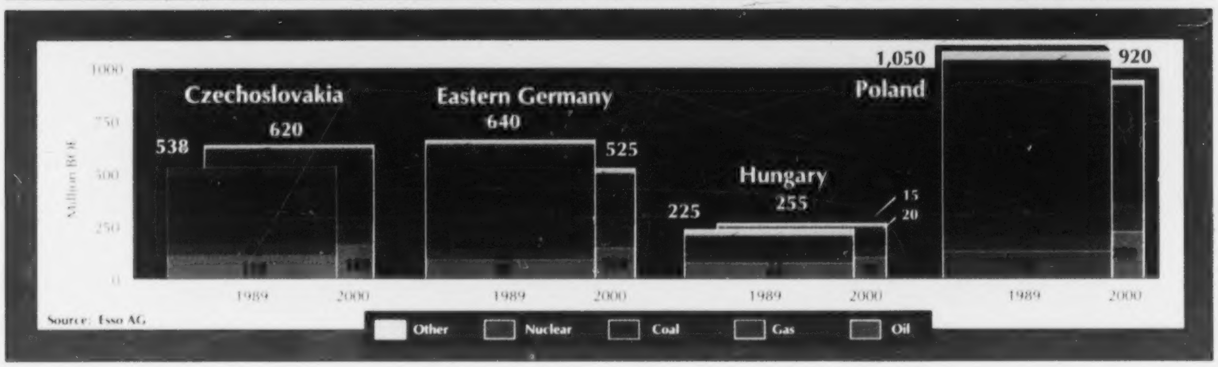
"In order to mobilize the power of the profit motive, large state enterprises are being converted to joint stock companies, and the formation of new small and medium sized enterprises is being encouraged."

Although these changes will be very positive in the long term, they spell a big drop in economic output and economic austerity in the near term. The extent of such a downturn will depend on each country's respective health at the beginning of economic transformation and how efficiently change is implemented.

Movit contends the economic pain eastern Europe is undergoing stems from irresponsible behavior by the former regimes in an effort to protect living standards and



*Estimated costs of imported Soviet energy in 1989 as a share of what they would have been at world market prices (WMP), correcting for inflated official ruble exchange rates formerly used in Soviet trade. Estimates use a realistic rate of 1 ruble = 49 cents vs. former official rate of 1 ruble = about $1.60. Source: PlanEcon



Source: Esso AG

thus sustain the rationale for the existence of the Communist system.

This irresponsible management generally involved:

- Monetary overhang. Communist leaders sought to keep prices of staple goods for the workers very low and to prevent inefficient firms from failing to avoid the social costs of unemployment. This was accomplished by an elaborate system of huge state subsidies resulting in chronic state budget deficits financed by printing money. Serious disequilibrium in consumer goods markets resulted, eroding incentives to labor.
- External debt. A number of these countries sought to

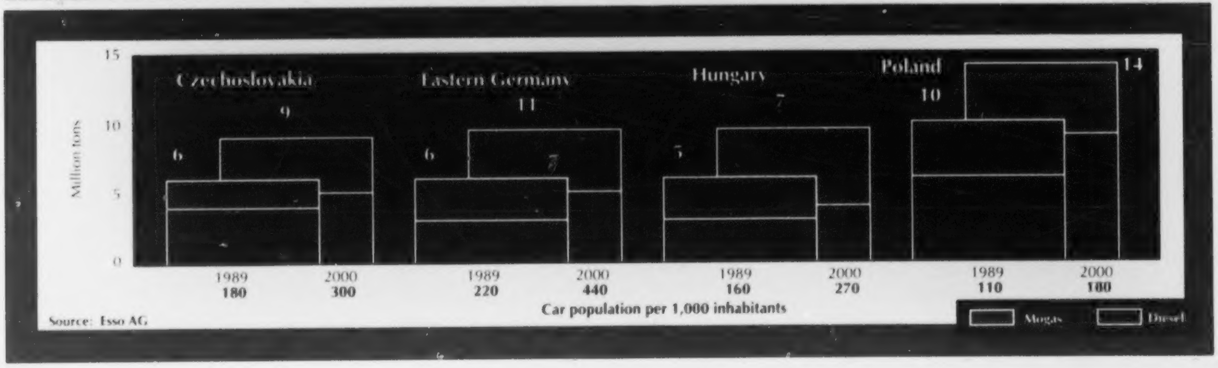
Table 2

**East European oil, gas trade***

| | Crude oil — 1,000 metric tons — | Refined products | Natural gas million cu m |
|---|---|---|---|
| **PRODUCTION** | | | |
| 1985 | 17,348 | 112,801 | 58,852 |
| 1986 | 16,708 | 116,936 | 58,372 |
| 1987 | 15,902 | 119,839 | 57,024 |
| 1988 | 15,438 | 120,112 | 55,363 |
| 1989 | 14,979 | 120,135 | 50,404 |
| IQ | 3,717 | 29,619 | 14,241 |
| 2Q | 3,796 | 30,196 | 11,577 |
| 3Q | 3,812 | 30,574 | 11,012 |
| 4Q | 3,654 | 29,746 | 13,274 |
| 1990 | 13,494 | 104,124 | 42,323 |
| 1Q | 3,452 | 27,626 | 12,456 |
| 2Q | 3,424 | 26,234 | 9,528 |
| 3Q | 3,394 | 24,243 | 9,265 |
| 4Q | 3,224 | 26,021 | 11,074 |
| **EXPORTS** | | | |
| 1985 | 874 | 22,262 | 776 |
| 1986 | 1,068 | 23,011 | 790 |
| 1987 | 730 | 23,685 | 1,014 |
| 1988 | 500 | 25,069 | 979 |
| 1989 | 930 | 27,201 | 2,096 |
| 1Q | 230 | 6,666 | 522 |
| 2Q | 230 | 7,050 | 523 |
| 3Q | 230 | 7,233 | 525 |
| 4Q | 240 | 6,252 | 526 |
| 1990 | 750 | 19,819 | 2,104 |
| 1Q | 180 | 5,379 | 523 |
| 2Q | 190 | 5,106 | 525 |
| 3Q | 190 | 4,726 | 528 |
| 4Q | 190 | 4,608 | 528 |
| **IMPORTS...** | | | |
| 1985 | 97,021 | 10,061 | 38,432 |
| 1986 | 102,696 | 9,420 | 42,893 |
| 1987 | 105,506 | 8,861 | 45,463 |
| 1988 | 105,521 | 8,492 | 46,329 |
| 1989 | 106,376 | 8,278 | 54,013 |
| 1Q | 25,209 | 1,878 | 13,700 |
| 2Q | 27,145 | 2,398 | 13,396 |
| 3Q | 26,969 | 1,965 | 12,829 |
| 4Q | 27,053 | 2,037 | 14,088 |
| 1990 | 89,873 | 7,728 | 54,739 |
| 1Q | 22,321 | 1,700 | 14,170 |
| 2Q | 24,154 | 1,705 | 13,201 |
| 3Q | 20,696 | 2,133 | 12,919 |
| 4Q | 22,702 | 2,190 | 14,449 |
| **...of which, from the U.S.S.R.** | | | |
| 1985 | 73,360 | 7,372 | 36,780 |
| 1986 | 80,597 | 7,418 | 41,283 |
| 1987 | 80,599 | 7,843 | 43,709 |
| 1988 | 78,107 | 7,763 | 45,198 |
| 1989 | 78,545 | 7,573 | 52,039 |
| 1Q | 18,219 | 1,584 | 13,222 |
| 2Q | 20,887 | 2,518 | 13,859 |
| 3Q | 20,132 | 1,191 | 12,325 |
| 4Q | 19,307 | 2,280 | 13,633 |
| 1990 | 61,438 | 7,314 | 52,483 |
| 1Q | 16,033 | 1,461 | 13,972 |
| 2Q | 16,320 | 1,643 | 12,846 |
| 3Q | 13,425 | 1,822 | 11,984 |
| 4Q | 13,660 | 2,388 | 13,681 |
| **Apparent consumption** | | | |
| 1985 | 113,522 | 100,600 | 96,508 |
| 1986 | 118,336 | 103,345 | 100,475 |
| 1987 | 120,678 | 105,015 | 101,473 |
| 1988 | 120,459 | 103,535 | 100,713 |
| 1989 | 120,425 | 101,212 | 102,321 |
| 1Q | 28,696 | 24,831 | 27,419 |
| 2Q | 30,711 | 25,544 | 24,450 |
| 3Q | 30,551 | 25,306 | 23,316 |
| 4Q | 30,467 | 25,531 | 26,836 |
| 1990 | 102,617 | 92,033 | 94,958 |
| 1Q | 25,593 | 23,947 | 26,103 |
| 2Q | 27,388 | 22,833 | 22,204 |
| 3Q | 23,900 | 21,650 | 21,656 |
| 4Q | 25,736 | 23,603 | 24,995 |

*Eastern Europe includes Bulgaria, Czechoslovakia, eastern Germany, Hungary, Pol[illegible] Romania, and Yugoslavia. †Figures for fourth quarter 19[illegible] estimates.

Source: PlanEcon



Source: Esso AG

borrow in the West to prop up consumption, resulting in heavy per capita debt burdens. Last year, Bulgaria was forced to declare a moratorium on debt repayment and is not on the road to full rescheduling. This has resulted in decreased access to western credit markets across the board for eastern European borrowers.

The exception is Czechoslovakia, where extremely conservative borrowing policies prevented any buildup of western debt.

● Disinvestment in the domestic economy. To further protect consumption, the burden of macroeconomic adjustment (such as that required by the contraction of available western credits in the early 1980s) was, to the degree possible, shifted to investment.

Thus debts were incurred with respect to domestic productive capital stock, with respect to much needed infrastructure, both social and economic, and with respect to the environment.

Movit says the new regimes in eastern Europe face the task of transforming the region's inefficient, outdated industrial infrastructure, an effort that calls for closing some enterprises and eliminating redundant jobs.

At the same time, those regimes must seek to stabilize economies by restoring balance in consumer goods markets, cope with heavy debt burdens, and start to reverse damage to infrastructure, productive base and environment caused by decades of mismanagement and neglect.

## Western investment needed

Eastern Europe's challenge can be made more manageable with an influx of western aid and investment that brings modern technology and resources to renovate capital stock and boost export competitiveness.

That means opportunities for western energy firms that can overlook the bleak near term economic outlook for eastern Europe's transition period and see the prospect of gaining a foothold in a large, almost untapped market with low wage costs, a relatively educated labor force, and attractive location.

Although investments have been small to date, "pioneering western firms are finding that bringing in a western management team can make a good deal of difference in an eastern European firm's profitability fairly rapidly," Movit wrote.

He uses a range of criteria to rank former Soviet satellites in eastern Europe for investment attractiveness, comparing them to the former U.S.S.R. (Table 1), noting their relative attractiveness hinges on a number of factors related to the legal environment as well as the outlook for political stability and return to strong economic growth.

Overall, Czechoslovakia, Hungary, and Poland fare best under the PlanEcon preliminary ranking, which was assembled prior to the full outbreak of civil war in Yugoslavia in 1991.

## Aggravating factors seen

Movit cites three factors aggravating the slowdown of economic transition and stabilization in eastern Europe and affect traditional export markets and trade terms.

The first factor involves the trade shock stemming from the dismantling of the Comecon trading system. The former Soviet satellites mainly have exported manufactured goods to the U.S.S.R. in exchange for Soviet exports of energy and other key raw materials (Table 2).

Soviet energy imports were paid for in nonconvertible rubles at special intra-Comecon prices.

The price formula entailed a 5 year moving average of world market prices. If the price of oil to eastern Europe were converted to dollars at the official Soviet exchange rate in 1989, East Europeans would have been paying more than $24/bbl for crude. However, because East European exports that paid for the oil were grossly overpriced in intra-Comecon trade, the real dollar value paid for Soviet oil was much lower.

Using a cross exchange rate of the ruble vs. the dollar based on costs in an eastern European economy of earning $1 and 1 ruble in foreign exchange through trade, that rate would have been about 1 ruble = 50¢ compared with the official Soviet exchange rate $1.60/1 ruble. Under this formula, the real price eastern Europe paid for Soviet oil was an average of less than $7.50/bbl, according to PlanEcon. That illustrates the huge energy subsidy Soviet oil provided those countries (Fig. 2).

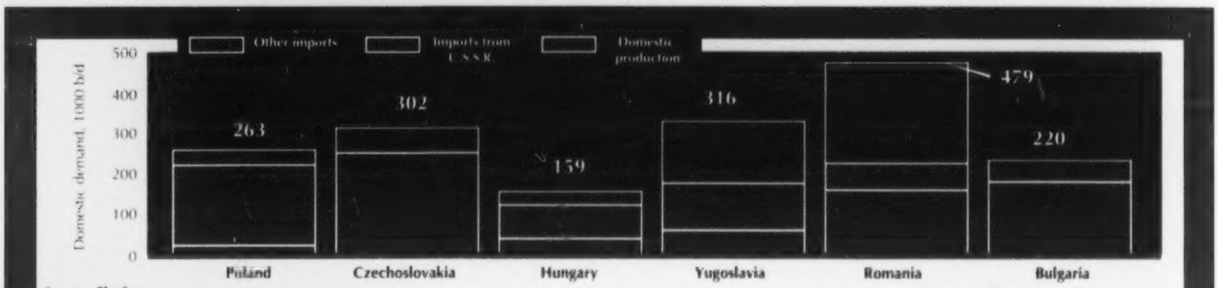
All that changed in 1991, with the Soviets requiring eastern Europe to pay world market prices for Soviet oil with bilateral trade to be settled in hard currency. In addition to the big shift in terms of trade in favor to the Soviets, the change created severe balance of payments pressure on the eastern European economies at the worst possible time.

Prior to the disintegration of the Soviet Union at yearend 1991, the Soviets had reached agreements with East European trade partners to help ease the effects of transition. With Hungary and Czechoslovakia, ruble surpluses accumulated in bilateral trade with the U.S.S.R. in the past were to be converted to dollar debt of the U.S.S.R. and used to offset some of the expected deficits in the future.

"Given the very sharp shift in their terms of trade, however, the new assets are going to be rapidly used up. In fact, the pace at which these assets can be drawn down to settle bilateral trade accounts is a current point of disagreement," Movit wrote.

Whether the agreement will be maintained with the Russian federation, the Soviet Union's successor as primary oil supplier to East Europe, remains to be seen.

The East Europeans believe they can make substantial



Source: PlanEcon

progress in several years and are anxious to use all of the assets the next 2 years to cushion the shock to domestic economies in transition to a market oriented economy. The former Soviet Union had preferred the assets be used over a longer period to offset bilateral trade deficits and was not in any shape to postpone prospective gains from the trade shift—even before the economy went into a complete tailspin that triggered the August coup and Communist Party downfall in second half 1991.

With Russian President Boris Yeltsin's recent, extremely risky market reforms, that is more so the case in 1992.

And, says Movit, added negative economic effects on any eastern European economy affects its neighbors, because these nations remain each others' major trading partners, contributing to a possible continuing downward spiral.

## Energy aspects

These economic and trade developments suggest often mutually offsetting implications for eastern Europe's energy sector.

Movit contends two things will mitigate the likely slide in domestic energy production accompanying economic dislocation in eastern Europe and the loss of affordable Soviet energy:

- The economic downturn will also mean a reduction in the quantity of energy consumed, although less than in proportion to the downturn in economic output.
- The transformation to a market economy will mean improved energy efficiencies by introducing higher relative prices for energy that will spur direct and indirect conservation measures.

Movit also sees the introduction of market principles spurring a shift from energy intensive heavy industrial production to light industrial goods and services and the pursuit of profit rather than just maximizing output. Under the Stalinist model, industry's share of energy consumption is very high compared with the international average. That should decline with the shift of economies to light industry, transport, services, and housing.

At the same time, expansion of truck and auto fleets in eastern European countries will boost demand for motor fuels.

Howver, the net effect, contends Movit, is a certain reduction in the energy intensity of economic output in eastern Europe.

## Environmental considerations

The newly emerging environmental consciousness in eastern Europe will complicate eastern Europe's efforts to mitigate its energy shortfall.

Movit points to the region's heavy reliance on very low quality, high sulfur lignite to generate electric power. PlanEcon estimates low quality coal (mostly high sulfur lignite) accounted for more than half the primary energy production in Bulgaria, Czechoslovakia, eastern Germany, and Yugoslavia in 1990.

Eastern European concerns about poor air quality and damage from acid rain caused by extensive burning of lignite are reinforced by western Europe's position that the environmental problem is shared.

Despite environmental and safety concerns about nuclear power, says Movit, most East European nations can't afford to abandon nuclear power programs because of their limited fossil fuel resources, notably hydrocarbons. Work will focus on assuring safe operation of existing plans with expansions postponed until improved safety designs, such as those used by the Finns in their Soviet designed reactors, can be incorporated.

## The former Soviet Union's role

The opening of energy markets in the former Soviet Union is a critical development for eastern Europe.

With the successor republics accelerating the pace of western investment in the former Soviet energy sector and trade between those republics and eastern Europe settled at world market prices and in hard currency, there is no longer an incentive for eastern Europe to take Soviet energy other than the existence of an infrastructure. And eastern Europeans are seeking to diversify energy supply sources in light of the severe cuts in Soviet oil deliveries they experienced in 1991.

"In the longer run, eastern Europe will be viewed as just one part of an expanded European energy market," Movit wrote.

"Nonetheless, for a variety of reasons, including historical and geographic, it is likely that the Soviet Union will continue to play a significant role as energy supplier in the region.

"The major question in regard to how significant that role might be is the likelihood that western energy firms will become involved in energy production in the Soviet Union—which could help to stem the decline in Soviet energy production—and thus support a higher level of net energy exports."

## Best market prospects

Esso's Kohlmorgen sees the former East Germany, Poland, Czechoslovakia, and Hungary as the eastern European nations offering the markets most likely to be developed in the near future.

He cites in particular the former East Germany because it was the most advanced member of the former Soviet bloc in industrial development.

Eastern Germany and Poland are already marking progress in energy efficiencies with shutdowns of inefficient and highly polluting industrial complexes and the implementation of their first energy conservation measures.

Esso predicts total energy demand in Poland and eastern Germany will fall despite a growth rate in gross domestic product of an average 5%/year in the second half of the decade (Fig. 3).

In first half 1991, eastern Germany's energy consumption fell 28% from the year before.

Esso also sees the energy mix in eastern Europe changing, reflecting the changes in western Europe during the 1960s and 1970s when oil and gas gained at the expense of coal and lignite.

A key component of increased oil demand will be expected sharp growth in motor gasoline and diesel fuel when improved standards of living spur increased purchases of private vehicles (Fig. 4).

As the economies grow, that will spur demand for commercial transportation and in turn increase demand for bitumen for road construction and lube sales for the growing vehicle fleets.

"This development is in widening contrast to the existing thin retail station networks operated by state monopolies under the principle: no service, no shops, and no spare parts, from badly maintained installations. They are located off the main roads to provide space for the lines of waiting customers," Kohlmorgen said.

## Supply infrastructure

The four major eastern European economies have remained heavily dependent on access to oil fields in the Soviet Union since World War II via the Friendship Piepline system (Fig. 5).

All four have more than sufficient refining capacity, in some cases allowing for exports of products.

As environmental pressures reduce use of coal, demand for heating oil is expected to rise sharply in the years to come, notably in eastern Germany (Fig. 6).

Imports of non-Russian crudes by Hungary and Czechoslovakia are possible via pipelines from the terminal at Rijeka, Yugoslavia, and to Poland via the harbor at Gdansk, Kohlmorgen notes (see Fig. 1). However, physical limitations throughout the region make access to western terminals a priority.

Eastern European refineries will require major modernization and upgrading to match a lighter demand barrel and at the same time meet stricter western standards for environmental protection.

Whether state owned refineries attract foreign equity or whether processing, exchange, and/or offtake arrangements will be more likely is less important, Kohlmorgen contends.

"Oil demand will grow, and existing processing capacity will be needed if it can be made efficient and environmentally acceptable," Kohlmorgen said.

"But governments that retain unprofitable refineries by subsidies or protectionist regulations will make a severe mistake."

## Investment decisions

Deciding whether or not to enter an eastern European market will prove a major decision for any oil company.

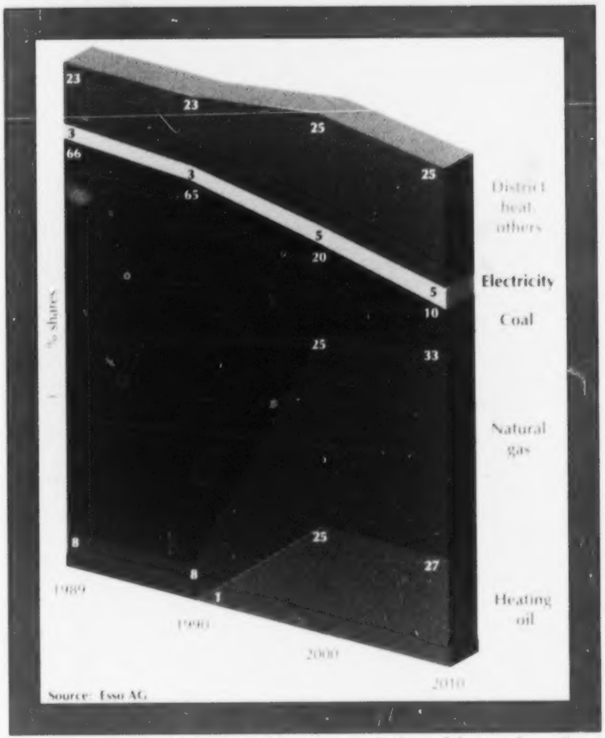
"In the majority of cases, the market entrances will require joint ventures with local, and this means in most cases, state owned companies—monopolistic suppliers of products," Kohlmorgen said.

"This often offers a solution for the fact that purchase of land is not yet permitted or very restricted for foreigners. Protection of investment, free profit distribution in hard currency, operating management, and other issues of vital importance for an investor frequently call for individual agreements with governments and/or partners.

"But we expect that the general investment environment will improve steadily because it is in the interest of the governments to attract foreign capital and know-how."

Fig.

Changing energy mix in eastern Germany



Source: Esso AG

He cites Czechoslovakia, which in late 1991 suspended regulations demanding a joint venture with a local partner for every foreign investment.

Similar rules in Poland and Hungary are expected to fall by the wayside.

Such joint ventures pose challenges to both partners, Kohlmorgen notes.

"The local partner must accept the technical and managerial know-how of the foreign company, share or even hand over the operational responsibility, and at the same time give up the security of a monopolistic seller who never had a reason to consider efficiency, costs, and customer relations.

"The foreign partner, on the other hand, must not only develop the business, but he must be highly sensitive with regard to the feelings not only of his local partners but also of politicians, authorities, media, and not to forget, customers.

"Although irreversibly moving towards a market economy system, the legal system, the tax system, administration, the attitude toward work and decisionmaking, the permitting process, and a lot more, are still largely influenced by the old system.

"I am confident that by the end of this decade the eastern European countries will have completed the transformation process from the Communist centrally planned economy to the market economy system.

"Part of this process will be the development of an oil market very similar to the one operating in western Europe. Most major oil companies and probably others will participate in this competition.

"This development will contribute to a better standard of living for people in eastern Europe—but it means also sound business opportunities for western oil companies." ◆

U.S. companies."

He said there are signs of improved trade with the Soviet Union in the petroleum equipment sector.

"U.S. direct exports of oil field machinery to the Soviet Union totaled $18 million in the first quarter of 1991 and could reach more than $70 million for the year. This compares with a total of $26 million in 1989 and only $1.8 million in 1990.

"To put these exports to the Soviet Union in perspective, total U.S. exports of petroleum equipment in 1990 were $2.6 billion, of which the largest volume of exports went to Venezuela, worth about $300 million."

### Investment climate

Exports of U.S. oil equipment and services to Russia were never high, but plummeted after President Jimmy Carter imposed foreign policy controls on oil and gas equipment exports to the Soviet Union in 1978 to protest human rights abuses. The controls were toughened in each of the next 3 years.

Moore notes "These unilateral foreign policy export controls disadvantaged American businesses. By 1983 the U.S. share of the Soviet petroleum equipment and services market had dropped to four tenths of one percent. Our European allies, Japan, and Canada stepped in to supply the equipment and services U.S. companies were barred from providing.

"The Commerce Department estimates that, had U.S. manufacturers continued to maintain their traditional share of the Soviet market, they would have received about $2 billion in orders during the 1979-85 period. instead they actually received $170 million.

"This loss of $1.83 billion cost individual American energy firms, and it cost the U.S. economy almost 46,000 jobs, based on Commerce's standard formula that each $1 billion in exports represents 25,000 jobs."

Moore said DOE has developed a list of petroleum technology and equipment the Soviets need, and all the possible sources of supply.

"Virtually without exception, the U.S. could meet every Soviet need with state of the art equipment and technology, but so could other suppliers, with at least adequate or high quality technology and equipment."

### Bilateral talks

An Energy Department workshop in 1991 brought Soviet energy officials and American oil company executives into more discussions on joint ventures.

Goal of the U.S. seminar was to establish a framework for technology cooperation, and expand commercial opportunities between U.S. firms and Soviet officials.

Rantik Margulov, first deputy chairman of the state fuel and energy commission of the U.S.S.R. Cabinet of Ministers, headed the Soviet delegation, which included representatives of the fuel and energy industries, and delegates of several major fuel producing republics.

At the end of the seminar, U.S. and Soviet officials agreed to continue to hold periodic consultations on energy policies and directions, and on world energy issues.

They also agreed DOE and private oil firms would exchange technology with the Soviet central and republic governments and energy entities.

The two countries will exchange information on the development of their respective national energy strategies, and will work to establish a working group to compare energy data, analytical methods, research and policy recommendations, and approaches to environmental problems.

The two countries will develop a program to exchange and assess data on oil and gas technologies, and to share scientific studies. That program may include personnel exchanges between government laboratories and private companies in both nations.

**Past and projected Soviet oil production**

| | Million b/d | % change/year |
|---|---|---|
| 1980 | 12.0 | NA |
| 1981 | 12.2 | 1.7 |
| 1982 | 12.2 | 0 |
| 1983 | 12.3 | 0.8 |
| 1984 | 12.2 | −0.8 |
| 1985 | 11.9 | −5.7 |
| 1986 | 12.3 | 3.4 |
| 1987 | 12.5 | 1.6 |
| 1988 | 12.5 | 0 |
| 1989 | 12.2 | −2.4 |
| 1990 | 11.4 | −6.6 |
| 1991 | 10.5 | −7.9 |
| 1992 | 9.6 | −8.6 |
| 1993 | 9.2 | −4.2 |
| 1994 | 9.1 | −1.1 |

**Source: General Accounting Office from PlanEcon data**

Moore explained U.S. companies seeking business in the Soviet Union are having problems determining whether to negotiate with the central or local governments, face tax policy problems, and need more protection for their "intellectual properties."

Moore said "When these are solved, you will find companies ready to move very quickly."

U.S. officials said American companies were interested in obtaining Soviet downhole turbine drilling, enhanced oil recovery, and steamflooding technology.

### Joint ventures

Yuri V. Dubinin, Soviet Ambassador to the U.S., predicted political changes in the Soviet system will "lay the foundation for a new mode of economic development" which will enable the Soviets to compete in world markets.

He said Russian leaders would like to "go as fast as possible to a market economy, but a transition period is needed."

He admitted the development of joint ventures has been slowed, partly due to "the absence of a business environment conducive to foreign investments."

Dubinin added, "We see the problem, we are trying to solve it, and we are open to any suggestions.

"Joint ventures will have to face new economic situations if market forces come to play a greater role in the U.S.S.R. or if economic decentralization in the country results in autonomy for the Soviet Republics."

He noted American and Soviet joint venture partners often are working at cross purposes.

"American firms want access to the Soviet Union while the goal of the Soviet laws is to attract foreign capital, equipment, technology, and management skills, and expand Soviet exports."

### Barriers seen

Both the Soviet and American governments must remove barriers if commercial trade is to grow.

A new Soviet-U.S. trade agreement and bilateral talks on investment rules, tax systems, and export controls will establish the framework and climate for future U.S.-Soviet business relations.

Frank Kitteridge, president of the National Foreign Trade

**Soviet crude and product exports**

| | Total net exports (Million b/d) | Annual % change | Net crude exports (Million b/d) | Annual % change | Net refined product exports (Million b/d) | Annual % change |
|---|---|---|---|---|---|---|
| 1985 ......... | 3.05 | NA | 2.09 | NA | 0.95 | NA |
| 1986 ......... | 3.39 | 11.35 | 2.30 | 9.75 | 1.10 | 14.87 |
| 1987 ......... | 3.59 | 5.85 | 2.45 | 6.71 | 1.14 | 4.05 |
| 1988 ......... | 3.66 | 1.85 | 2.48 | 1.14 | 1.18 | 3.38 |
| 1989 ......... | 3.39 | – 7.31 | 2.28 | –8.08 | 1.11 | – 5.69 |
| 1990 ......... | 3.21 | – 5.29 | 2.23 | –2.10 | 0.98 | –11.82 |
| 1988-90 ..... | | –12.21 | –10.01 | –16.84 | | |

Source: General Accounting Office from PlanEcon data

Council Inc., said "From the U.S. point of view, these agreements are critical because competition for access to Soviet markets is intense, and our major trade competitors are considerably ahead of us."

Kitteridge said granting of most favored nation status for the Soviet Union "is extremely important from a symbolic point of view, and for putting U.S.-Soviet trade on a proper foundation for growth and development."

He added "Such major concerns as the inadequate availability of hard currency and the inconvertibility of the ruble present major obstacles to trade development for both sides.

"The process of accreditation for U.S. businesses in the U.S.S.R. needs to be addressed, as does the critical need for a broader Soviet economic statistical base on which to base financial and investment decisions.

"Immigration, visa, and travel controls on both sides must be significantly relaxed for the pace of business to accelerate, and import licensing procedures, banking practices, and communication facilities all must be addressed in this new trade agreement."

Kitteridge said a bilateral investment treaty is needed to permit repatriation of profits, and the current U.S.-Soviet income tax treaty is outdated.

"For example, the treaty is silent as to the 20% dividend withholding tax imposed by the Soviets on distributions to foreign investors, whereas the recent Soviet treaties with the United Kingdom and other countries completely eliminate this withholding tax."

He added the U.S.S.R. does not yet have corporation law, bankruptcy and antitrust laws, or comprehensive investment law.

## More barriers

In a report to the U.S. Congress, the General Accounting Office found lingering Cold-War policies of both governments are hindering American oil companies from helping improve Russian production.

It said Soviet oil production is dropping because the country lacks the capital to finance exploration and production and maintain older equipment.

"This lack of capital results from cutbacks in government funding, uneconomical pricing of oil products, and escalating exploration and production costs."

The study also said the Russians are using outdated and inefficient turbo drilling methods, which require frequent bit changes, to drill about two thirds of their wells. It said they use waterflooding for primary recovery, and most of their oil exploration technology and equipment is obsolete.

GAO notes Soviet officials have said if Russia is to maintain 1990 production levels, it will have to double drilling over the next 5 years and build new pipelines.

"A number of problems impede U.S. trade and investment in Soviet oil exploration and production. U.S. oil companies and petroleum equipment suppliers assert that two 1974 congressional restrictions—the Byrd amendment to the Trade Act of 1974 and the Stevenson amendment to the Export-Import Bank Act of 1945—limit U.S. ability to provide competitive export credit guarantees and insurance.

"These amendments were enacted when the Congress was concerned about granting credit guarantees and insurance involving foreign production of energy while the U.S. needed capital to develop energy at home. In addition, the Congress was concerned about subsidizing energy trade with the Soviet Union and about Soviet policies for emigration and its military forces in Europe."

GAO said the amendments prohibit U.S. Export Import Bank loans and financial guarantees for the purchase, lease, or procurement of any product or service used to produce fossil fuel energy resources.

They also limit export credit guarantees and insurance for energy research and exploration projects to $40 million, and set a $300 million ceiling on the amount of financing ExIm Bank can support with credit guarantees and insurance.

GAO said if Congress repeals the Stevenson and Byrd legislative barriers it "would not mean immediate U.S. loans and guarantees to the Soviet energy sector" and "ExIm Bank would still apply its standard procedures for assessing the risk of nonpayment of loans."

It said another major impediment to trade and investment is the Soviet unfamiliarity with basic western business practices and management skills.

GAO said the existing U.S.-Soviet tax treaty, which is being renegotiated, lacks profit repatriation and foreign income tax credit provisions.

## U.S. policy shift

The Bush administration has taken several steps to remove the barriers to trade on the American side.

In mid-1991 it asked Congress to approve most favored nation trade status for the Soviet Union, which would allow the lowest possible tariffs on imports to the U.S.

The administration also planned to ask for the same status for the newly independent Baltic republics of Latvia, Lithuania, and Estonia.

Most favored nation status would have little effect on American exports to the Soviet Union, which is short of internationally traded currencies.

Soviets exports were $1.1 billion to the U.S. in 1990, and might rise by $400 million/year. Administration officials explained most imports from the Soviet Union are raw materials, which have very small tariffs.

The administration also was asking Congress to ratify a U.S.-Soviet trade agreement signed in 1990.

And it waived the Jackson-Vanik amendment, a 1974 law that restricts U.S. economic cooperation with countries that block free emigration of their citizens. That makes the Soviets eligible for export credit guarantees for agricultural goods and financing from ExIm Bank and the Overseas Private Investment Corp.

## Union Treaty

The most positive step the Soviets took to improve trade was the central government's signing an all-union treaty with the republics—although the threat of an all-union treaty had prompted the abortive Aug. 19 coup.

In October, eight of the 12 republics signed the agreement to create a free market community to replace the old regulated economy. More may sign later.

The accord lays the groundwork for further negotiations on up to 20 separate treaties detailing free market relationships, including ones defining the responsibilities and authorities of central and republic governments, establishing ownership rights, setting tax structures, and writing rules governing the management of the energy industries.

The treaty will place control of resources more directly in the hands of the republics, and smooth the way for joint oil and gas ventures with foreign companies.

That in turn would help resuscitate the ailing Soviet oil industry with an infusion of hard currency and technology, and ultimately restore plummeting oil production and exports.

Edward Gendelman, president of Wavetech Geophysical Inc., Denver, said the failure of the 2-day coup will prove a boon for foreign oil ventures because it "maintained the constitutional government and in one shot took care of key hard liners. Reform will move much faster now."

Wavetech has a joint venture with the Ministry of Geology to provide geophysical and geological data on areas in the Turkmen republic.

He said the coup's failure demonstrates to foreign companies that change in the Soviet Union is irreversible, and has enabled more Soviet reformers to assume key positions.

### Other Soviet actions

Hans Jochum Horn, managing partner for Arthur Andersen operations in the U.S.S.R., said the Soviet republics have basically taken over oil and gas operations from the central government and are working to create the stable legal and economic framework needed to attract foreign investments.

The Russian republic, which has 90% of most oil and gas reserves, has been working with the University of Houston on drafting model petroleum legislation which would provide a stable legal and economic framework for foreign venture partners. An initial draft was due early 1992.

The draft code is expected to become the basis for rewriting the country's oil and gas law.

George Hardy, director of the project for the university, said the draft also may become the model for legislation in other Soviet republics.

The law is expected to redefine contractual relationships covering joint ventures, concessions, licenses, and other exploration and production agreements between the Russian republic and foreign companies.

Among other topics, the draft legislation will cover oil and gas conservation, environmental protection, taxes and economic rules, oil and gas pipeline regulation, and technology transfer.

Hardy said Russians working on the project have voiced concern on how to let oil and gas prices rise to market levels and the effect on the domestic economy, whether to form a national oil company, how to privatize the exiting oil and gas industry without allowing the existing state monopolies to become private monopolies, and how to assure free trade and competition among the republic's provinces.

### Political risk

Despite the progress on both sides, much political risk remains.

Ronald Benson, vice president of Phibro Energy Inc. and director of the White Nights joint venture, said "For American companies to put their capital into Russia there has to be some sort of stability, especially for the oil and gas industry, which requires so much capital.

"Our biggest concern is the political situation in the Soviet Union. You couldn't go to a bank anywhere in the world and get money to do a project like this today in the Soviet Union. You've got to take a risk."

But the Petroleum Industry Research Foundation Inc., in a report on investing in the Soviet Union, said "Although the unstable political environment is likely holding back considerable western investment, operating in an unstable political environment is not uncommon for U.S. oil companies. Instability in the political environment is compounded by a lack of understanding on the part of the Soviets regarding what represents an acceptable business arrangement.

"Different needs must be met, i.e., environmental, local, and financial concerns, new technology—often all among different agencies—before a deal can be concluded. Furthermore, it remains unclear where the starting and ending points are for a successful cooperative venture."

**Soviet capital investment in oil production**

| | Amount (Billion rubles) | Annual % change |
|---|---|---|
| 1982 .................... | 9.6 | NA |
| 1983 .................... | 10.0 | 4.2 |
| 1984 .................... | 10.3 | 3.0 |
| 1985 .................... | 11.5 | 11.7 |
| 1986 .................... | 12.9 | 12.2 |
| 1987 .................... | 14.6 | 13.2 |
| 1988 .................... | 15.3 | 4.8 |
| 1989 .................... | 15.5 | 1.3 |
| 1990* .................... | 14.8 | −4.5 |

*Estimated.

Source: General Accounting Office

### The future

Much remains to be done before foreign oil ventures really blossom in the Soviet Union, and then there is a limit on what they can achieve.

Salomon said "Even if the Soviets had the funds to remount an aggressive exploration and development campaign, we doubt that they could reverse the downward slide of the country's crude oil production.

"Current water cuts and depletion rates seem too high for such a turnaround. The Soviets must start anew with fresh exploration prospects, better-paced development, more effective equipment, and new ideas about managing the country's energy resources, as well as its energy consumption pattern. All of this will require capital.

"The western oil firms, which can provide the investment capital, as well as the technology and management skills necessary for such a shift, are the best source—in truth, the only source—of these funds. Thus far, the Soviet politburo has given a lukewarm welcome to western investments in the petroleum sector. Officials want the West's capital and equipment but have ambivalent feelings about western ownership of 'national patrimony.'

"The picture is complicated further by frictions between the republic governments and the Union government. A pattern has developed: the Union government awards western oil firms oil concessions in politically truculent republics; the locals, in turn, quickly sabotage the Moscow-inspired plan to take their resources. When local governments, in turn, have made their own arrangements with western firms, the ventures seem predestined to snag on Moscow's red tape."

Until the Soviets can sort out their political/legal problems, western oil firms for the most part will look at but not touch Soviet energy investments.

Table 1

### How gas resource estimates have changed

| Province | Probable | | | Possible | | | Speculative | | |
|---|---|---|---|---|---|---|---|---|---|
| | Minimum | Most likely | Maximum | Minimum | Most likely | Maximum | Minimum | Most likely | Maximum |
| | BCF | | | | | | | | |
| **Onshore, less than 15,000 ft** | | | | | | | | | |
| Arkoma basin 12/90 | 2,556 | 3,244 | 3,966 | 1,731 | 2,315 | 3,191 | 1,364 | 1,881 | 2,473 |
| Arkoma basin 12/88 | 2,250 | 3,500 | 4,100 | 1,000 | 1,550 | 1,750 | 1,200 | 1,800 | 2,050 |
| Anadarko basin, Palo Duro basin, etc. 12/90 | 10,450 | 16,100 | 26,300 | 8,400 | 14,950 | 27,000 | 10,800 | 20,100 | 39,100 |
| Anadarko basin, Palo Duro basin, etc. 12/88 | 10,300 | 16,600 | 27,300 | 8,600 | 16,000 | 28,700 | 11,200 | 22,500 | 41,300 |
| **Onshore 15,000-30,000 ft** | | | | | | | | | |
| Arkoma basin 12/90 | 200 | 300 | 350 | 250 | 400 | 500 | 300 | 500 | 650 |
| Arkoma basin 12/88 | 200 | 300 | 350 | 250 | 400 | 500 | 300 | 500 | 650 |
| Anadarko basin, Palo Duro basin, etc. 12/90 | 4,800 | 8,300 | 16,100 | 5,400 | 9,400 | 18,300 | 2,300 | 4,100 | 8,100 |
| Anadarko basin, Palo Duro basin, etc. 12/88 | 4,800 | 9,000 | 21,800 | 5,000 | 9,200 | 22,200 | 2,700 | 5,000 | 11,900 |

Source: Potential Gas Committee, Colorado School of Mines

New field wildcatting was at a low level, and most drilling consisted of increased density spots in existing fields. Numerous wells turned up new pay discoveries in existing fields in western Oklahoma and the Texas panhandle.

Several horizontal wells were completed in widely spaced areas of Oklahoma.

## Arkoma permitting steady as Oklahoma, Arkansas fall

The basin has maintained a fairly steady level of activity during the last 5½ years, based on the number of applications for permits to drill (APDs) filed.

The average number of Arkoma basin APDs filed since the beginning of 1986 has varied only slightly, with a low of 41/month during January-May 1991 vs. a high of 54/month in 1988, figures from Dwights Energydata Inc., Oklahoma City, showed. By contrast, the number of APDs filed statewide since first quarter 1986 is down 62% in Arkansas and 54% in Oklahoma.

While as recently as late 1990 there were reports of rig shortages in the Arkoma, operators said contractors kept up with permitting during 1991.

Cambro-Ordovician Arbuckle and overthrusted Pennsylvanian Spiro-Wapanucka have been the focus of the boom, but older fields in the basin also have benefitted from attention drawn to the area.

## Spiro-Wapanucka play moving east, south

A string of Spiro-Wapanucka gas fields has sprung up since 1988 along an approximately 30 mile front from south of Haileyville in Pittsburg County, Okla., to south of Panola in Latimer County.

The fairway is as wide as 8 miles and contains the potential for wells with reserves of 6-30 bcf.

Development drilling was particularly intense in South Panola field, which AnSon Co., Oklahoma City, discovered in October 1990.

Five South Panola field wells of record had produced a combined 13.4 bcf of gas through July 1991, and the field had 17 other wells in various stages of progress in two townships.

Dry hole costs to drill overthrusted Spiro at 14,000-16,500 ft surpass $2 million, while drilling and completing an overthrusted Spiro well costs $3-3.5 million.

ARCO Oil & Gas Co. completed another discovery between South Wilburton and South Panola fields.

The 1 James, 7 miles south of Wilburton, flowed 3.976 MMcfd of gas through a $^{20}/_{64}$ in. choke with 2,157 psi flowing tubing pressure from Pennsylvanian Spiro perforations at 14,597-644 ft without treatment.

The company estimated the well's reserves at 15 bcf of gas.

To the west in Latimer County, South Hartshorne field through April 1991 had produced 34.3 bcf of gas from 14 wells completed in Spiro.

## Arbuckle exploration down but not out

Unsuccessful outcomes at numerous Arbuckle wildcats in the basin and downgrading of reserve estimates at the basin's only significant Arbuckle discovery have driven some newcomers away and disillusioned many stalwart operators.

ARCO Oil & Gas Co. originally estimated Wilburton field Arbuckle reserves at 500-600 bcf, or 42-50 bcf/well. But as of spring 1991 the field had produced only 186 bcf. ARCO isn't saying whether it has adjusted its reserve estimate, but others have insisted the field will ultimately produce only about 350 bcf.

The company completed the 15th Wilburton Arbuckle producing well in mid-1991 flowing 5.4 MMcfd of gas from open hole at 13,880-14,100 ft.

Helmerich & Payne Inc. completed the 16th Wilburton Arbuckle producing well in late 1991. It redrilled a well in 18-5n-19e that Exxon had abandoned in late 1990.

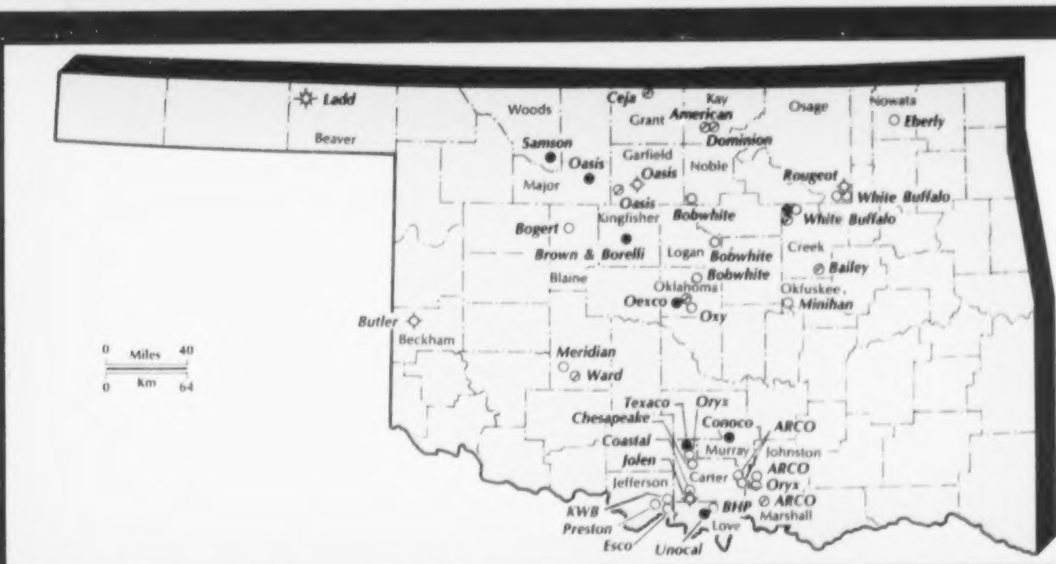
H&P's sidetrack flowed 12.676 MMcfd of gas and 73 b/d of load water from Arbuckle at 13,558-14,185 ft.

All of the basin's deepest Arbuckle penetrations have been noncommercial, and only a few of those expensive wells have been completed in economic shallower formations. Steeply dipping formations, high drilling costs, and misinterpreted seismic data have been blamed for the failures.

Mobil Oil Corp. set a drilling depth record for the basin at its 1 Green Bay Packaging well in LeFlore County. The wildcat, which was intended to test Arbuckle, was dry at a total depth of 21,935 ft.

Exxon Co. U.S.A. held the old record, 19,046 ft, at its 1 Retherford dry hole completed in 1985 in Latimer County.

### Usage of horizontal drilling in Oklahoma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Preston
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Unocal

deep water, adverse weather, relatively heavy oil, and complex reservoir properties. The development will require innovations such as horizontal drilling, subsea wells, and floating production systems, it said.

Alcorn (Production) Philippines Inc. planned to use two horizontal wells to drain the northeast and southern margins of West Linapacan A field off Palawan Island.

## Latin America, Africa getting horizontal wells

Horizontal wells were drilled during the year in Bolivia and Mexico, and Argentina and Ghana were studying their use.

Yacimientos Petroliferos Fiscales Bolivianos drilled that country's first horizontal well, VGR-29, during the year to improve production and recovery efficiency in Vuelta Grande field.

The field, 185 miles southeast of Sucre, had been on production 18 months, with 16 wells producing 90 MMcfd of gas and 2,600 b/d of condensate.

The well, with horizontal displacement of 1,673 ft in the productive formation, is bottomed at 5,638 ft subsea, about 100 ft above the common hydrocarbon/water contact of the Cretaceous Tapecua and Triassic Cangapi formations.

Mexico in 1991 was drilling its first horizontal wells. The first, in Agua Fria field near Poza Rica in the Veracruz region northeast of Mexico City, was to have a 3,940 ft horizontal section at 9,020 ft MD.

Total Austral said horizontal wells might be needed to develop oil in four satellite fields in Argentina near Hidra field off Tierra del Fuego.

Total said the four fields could hold a combined 35 million bbl of reserves. It said the fields could be developed by the mid-1990s to maintain oil flow through Hidra facilities.

Ghana National Petroleum Corp. was studying the use of horizontal drilling to increase production from South Tano oil field and reactivate production in Saltpond field offshore.

## Canadian horizontal drilling is updated

Several hundred horizontal wells have been drilled in Canada.

Among the most successful areas for horizontal completions in Canada are Suffield, Alta., and Long Lake and

### Estimated horizontal well costs for 1990

| State/area | Horizontal wells | Total footage | Total cost | State cost per foot |
|---|---|---|---|---|
| | | | $ | |
| Alabama | 1 | 15,354 | 1,347,753 | 87.78 |
| California-East Central | 1 | 1,680 | 119,592 | 71.19 |
| Colorado | 6 | 41,523 | 1,309,654 | 31.54 |
| Illinois | 1 | 3,005 | 53,350 | 17.75 |
| Louisiana-North | 11 | 17,557 | 492,360 | 28.04 |
| Louisiana-Offshore | 2 | 16,781 | 5,520,103 | 328.95 |
| Michigan | 1 | 10,877 | 1,423,708 | 130.89 |
| Mississippi | 2 | 10,964 | 2,826,013 | 257.75 |
| Montana | 6 | 57,421 | 4,572,368 | 79.63 |
| New Mexico-East | 1 | 4,900 | 200,239 | 40.87 |
| New Mexico-West | 1 | 6,107 | 319,658 | 52.34 |
| North Dakota | 70 | 901,561 | 94,353,014 | 104.66 |
| Oklahoma | 6 | 26,949 | 1,959,497 | 72.71 |
| Texas Dist. 1 | 571 | 5,266,468 | 434,770,197 | 82.56 |
| Texas Dist. 3 | 89 | 957,464 | 99,590,701 | 104.02 |
| Texas Dist. 5 | 1 | 3,409 | 276,000 | 80.96 |
| Texas Dist. 6 | 3 | 24,483 | 2,232,172 | 91.17 |
| Texas Dist. 7B | 5 | 42,968 | 1,454,857 | 33.86 |
| Texas Dist. 7C | 1 | 8,180 | 262,249 | 32.06 |
| Texas Dist. 8A | 3 | 22,734 | 1,176,369 | 51.74 |
| Wyoming | 9 | 65,731 | 7,440,219 | 113.19 |
| Total | 791 | 7,506,116 | 661,709,073 | 88.16 |

Source: American Petroleum Institute; Joint Association Survey on Drilling Costs

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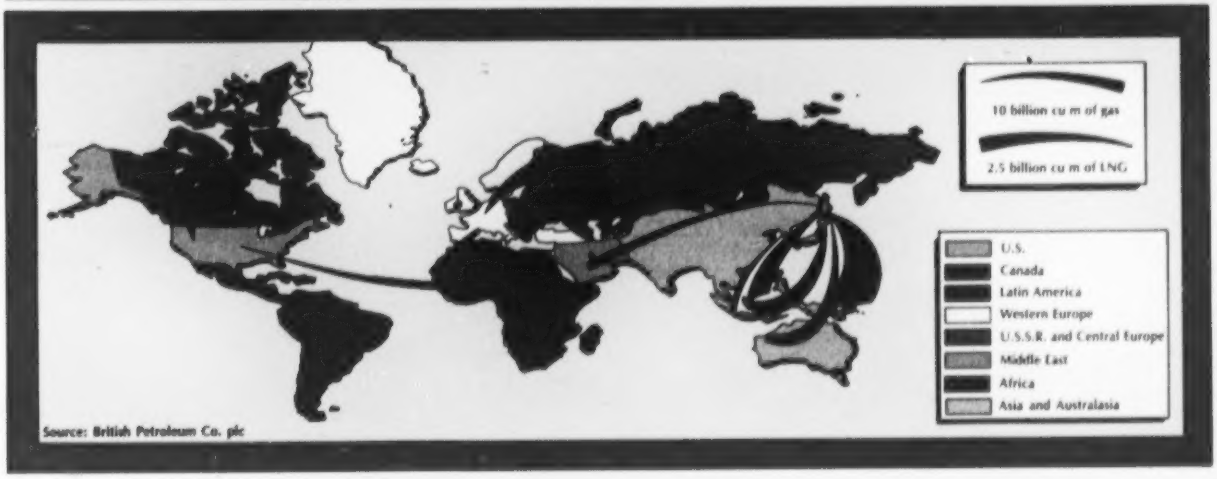


Source: British Petroleum Co. plc

age to help Algeria's state owned Sonatrach refurbish and hike capacity of a liquefaction plant at Skikda, Algeria. Eximbank approved a repayment guarantee to cover the sale to Sonatrach of U.S. equipment and engineering services by Sofregaz U.S. Inc., Houston, an engineering and construction subsidiary of Gaz de France.

The bank said the Algerian hydrocarbon sector generated more than 96% of Algeria's export earnings and 55% of total government revenue.

Sonatrach will refurbish and expand three of its four liquefaction plants to serve new long term LNG sales contracts. It estimated the total project will cost $2.2 billion.

Eximbank since 1967 has approved $1.2 billion in authorizations for Sonatrach, and 1991 exposure was $307 million. In the 1991 deal, the bank agreed to guarantee repayment of $42.5 million of the $50 million Sofregaz contract price. To meet export credit competition from other countries, the bank also guaranteed financing for local costs equal to 15% of the contract price, or $7.9 million.

The bank guaranteed repayment of a loan for purchase of $67.4 million of gas separation equipment and services from Air Products & Chemicals Inc., Allentown, Pa. Air Products will provide equipment and engineering services for construction of a helium separation plant adjoining the LNG plants at Bethioua on the west coast of Algeria. It will build the plant, train operators, and oversee operation.

Eximbank also agreed to guarantee repayment of a $59.2 million loan from the Private Export Funding Corp. to Helios Spa of Arzew, Algeria, a joint venture owned 51% by Sonatrach and 49% by Helap, which is jointly owned by subsidiaries of Air Products and Air Liquide of France.

## Australia

The Woodside Offshore Petroleum Pty. Ltd. group's Northwest Shelf LNG project set an Australian construction safety mark in August 1991 when the Train 3 construction program completed 2 million man-hr of work without a lost time injury.

It marked completion of almost 2 years of continuous construction work without a lost time injury, since work started in September 1989, on the $1 billion third train and other onshore facilities. Addition of the train will boost capacity of the group's plant on the Burrup Peninsula near Karratha, Western Australia, to 6 million metric tons/year starting in 1993.

Woodside's first two trains started up in June 1989 at a cost of $2.6 billion (Australian). The first tanker shipment of LNG to utilities in Japan was completed the following August.

The KJK joint venture, made up of Kellogg Overseas Corp., JGC Corp., and Kaiser Engineers Australia, is engineering, procurement, and construction contractor.

## Indonesia

Indonesia's Pertamina in September obtained financing for another train at the Bontang LNG complex in East Kalimantan. The expansion is to aid Pertamina in supplying LNG to three Japanese companies.

A group of international banks agreed to provide a

Table 1

**1990 LNG trade contracts**

| Exporter | Importer | Contract volume (bcf/year) | Tankers employed |
|---|---|---|---|
| Algeria | France | 353.2 | 5 |
| | Belgium | 190.7 | 2 |
| | Spain | 120.1 | 6 |
| | U.S. | 243.7 | 4 |
| | U.K. | 7.1 | 1 |
| | Japan | 14.1 | 1 |
| Libya | Italy | * | 1 |
| | Spain | 38.8 | 3 |
| U.S. | Japan | 102.4 | 2 |
| Brunei | Japan | 254.3 | 7 |
| Abu Dhabi | Japan | 98.9 | 5 |
| Malaysia | Japan | 300.2 | 5 |
| Australia | Japan | 300.2 | 3 |
| Indonesia | Japan | 748.7 | 15 |
| | Taiwan | 74.2 | 1 |
| | Korea | 98.9 | 2 |

*Not available.

Source: American Gas Association from Gotaas-Larsen Shipping Corp. data

**Table 2**

**How selected prices compare**

| | LNG cif Japan | Natural gas EC western Europe | Natural gas U.S. wellhead | Natural gas U.S. imports | Crude oil cif IEA countries |
|---|---|---|---|---|---|
| | U.S. $/MMBTU | | | | |
| 1975 | 1.7 | 1.0 | 0.4 | 1.8 | 1.9 |
| 1976 | 1.8 | 1.4 | 0.6 | 2.6 | 2.4 |
| 1977 | 2.1 | 1.7 | 0.8 | 2.9 | 2.6 |
| 1978 | 2.4 | 1.9 | 0.9 | 3.3 | 2.6 |
| 1979 | 2.8 | 2.1 | 1.2 | 3.9 | 3.7 |
| 1980 | 5.1 | 3.0 | 1.6 | 4.2 | 6.0 |
| 1981 | 5.8 | 3.6 | 2.0 | 4.7 | 6.7 |
| 1982 | 5.7 | 4.0 | 2.5 | 4.8 | 6.2 |
| 1983 | 5.1 | 3.8 | 2.6 | 4.3 | 5.5 |
| 1984 | 4.9 | 3.7 | 2.7 | 4.0 | 5.3 |
| 1985 | 5.0 | 3.8 | 2.6 | 3.1 | 5.0 |
| 1986 | 3.9 | 3.6 | 2.0 | 2.5 | 2.7 |
| 1987 | 3.4 | 2.6 | 1.7 | 2.1 | 3.3 |
| 1988 | 3.2 | 2.3 | 1.7 | 2.0 | 2.7 |
| 1989 | 3.2 | 2.1 | 1.8 | 2.0 | 3.2 |
| 1990 | 3.6 | *2.8 | *1.7 | *2.0 | *4.0 |

*Based on prices for first 9 months.

Source: British Petroleum Co. plc from International Energy Agency data

syndicated loan for the project. The Jakarta Post quoted A. Sidik Nitikusuma, a spokesman for Pertamina, as saying the $750 million loan was being coordinated by Chase Manhattan Bank and Mitsubishi Bank of Japan.

The train will be added to supply 2.1 million tons/year of LNG to Osaka Gas Co., Tokyo Gas, and Toho Gas Co. under 20 year contracts. Deliveries of increased volumes from the Bontang complex are to begin early in 1994.

Pertamina Pres. Faisal Abda'oe said his company will be able to repay the loan in 10 years using only 60% of the value of LNG exports from the project.

The loan has a 13 year maturity, including a 3 year grace period, and will have an interest rate of 1.25%/year above the London interbank offered rate.

An Indonesian firm, Inti Karya Persada Teknik, is building the train, designed by Chiyoda Corp. of Japan.

Pertamina in 1991 was operating five LNG trains, each with a design capacity of 2.3 million tons/year, at Bontang on Borneo Island and six others, each rated at 2 million tons/year, at Arun on Sumatra Island. The sixth LNG train at Bontang will increase Indonesia's LNG exports to Japan, South Korea, and Taiwan to 24 million tons in 1994 from 20.63 million tons in 1990.

## Malaysia

Royal Dutch/Shell Group companies in Sarawak and Sabah, Malaysia, were poised for major increases in offshore spending. Outlays were to focus in part on supplying more gas for expansion of Malaysia LNG Sdn. Bhd.'s Bintulu, Sarawak, liquefaction plant.

The biggest volume of additional gas will be required by the second phase of Malaysia LNG. When a $1.7 billion expansion is complete in 1996, gas consumption will rise to 2.4 bcfd from 1 bcfd. Addition of three LNG trains will boost plant capacity to 15 million metric tons/year from 8 million metric tons/year. The expansion is to include a new shipping jetty and new storage tank.

Production from the first phase of the LNG operation, which started up in 1983, is sold under long term contracts to Japan. Shipments of second phase production will include 2.3 million metric tons/year to Taiwan and an additional 2.5 million metric tons/year to Japan.

The number of LNG vessels required for the project will rise to 12 from the 1991 fleet of six.

State owned Petroliam Nasional Bhd. (Petronas) owns a 60% interest in the first phase of the project. Its partners are Shell Gas BV and Mitsubishi Corp. 17.5% each and the Sarawak state government 5%. In phase two, Shell and Mitsubishi's interests will be cut to 15% each, with a corresponding increase in the shares held by the two government bodies.

## Nigeria

Plans for Nigeria's first liquefaction plant took a major jump in mid-1991 when Nigeria LNG Ltd. wrapped up terms for sale of the entire production from the proposed plant at Finima, Rivers state. Sources said although behind schedule, exports of Nigerian LNG to Europe and the U.S. appear to be possible within the following 6 years.

Lined up as buyers for Nigerian LNG were the Italian state power generation company ENEL, Spain's Enagas, Gaz de France, and Distrigas Corp. of the U.S. The four buyers will take all the plant's 4.6 million metric tons/year for 22½ years, which includes the initial supply and buildup periods.

Pierre Gadonneix, general manager of Gaz de France, said the Nigerian contract will amount to only 1.85% of the company's imports. But it is in line with the policy of diversifying sources of supply. In 1991 they were Netherlands, U.S.S.R., and Algeria in addition to domestic gas. He said Gaz de France is prepared to extend the contract if and when Nigeria decides to expand the project.

Nigeria LNG, a joint venture of Nigerian National Petroleum Corp. 60%, Shell Gas BV 20%, Agip International BV 10%, and Ste. Nationale Elf Aquitaine unit Cleag Ltd. 10%, said it needs to complete project financing, which could take about a year. This places first deliveries from the $4 billion project early in 1997, 2 years behind the original start-up date.

Ahmed Joda, chairman of Nigeria LNG, said France's Technip and M.W. Kellogg completed a $17 million design specification for the plant in 1990, which led to the $4 billion cost estimate. He said the project will be financed by shareholders equity and loans on a 40-60 basis.

The 2 year delay in start-up for gas delivery is partly due to long marketing negotiations and to "a rather optimistic project schedule" established when the project was disclosed in 1989.

The liquefaction plant will require about 5.7 billion cu m/year of gas, which will be delivered from local sources through a new 125 mile pipeline network included in the overall project.

Tender documents for the next phase of work—engineering, procurement, and construction of the plant, gas pipelines, telecommunications system, and residential area—were to be released to two groups of companies that emerged from a prequalification process involving about 26 companies.

Technip and Kellogg were to bid in partnership with Italy's Snamprogetti SpA and Japan's JGC Corp. Ranged against them were to be Bechtel Corp., Japan's Chiyoda Corp., Germany's Thyssen, and France's Spie Batignolles.

Joda said the contract will be let in 1992.

Four LNG vessels have been acquired for the project. The LNG Finima and LNG Bonny are chartered to Malaysian LNG and Pertamina for work in the Far East. The two other vessels, LNG Lagos and LNG Port Harcourt, are laid up.

## Portugal

Portugal, with no oil or gas production, decided in 1991 to join the world's list of LNG importers. The Portuguese government chose a group made up of French, German, and Portuguese companies to implement its proposed introduction of natural gas to the country.

Discussions with the group to draft a licensing agree-

At about 880 ft, the Hamills found oil shows that, based on their experience with wells near Corsicana, they estimated could produce 50 b/d.

The Hamills halted operations Christmas day 1900, resuming work Jan. 1, 1901. On Jan. 10 at a depth of 1,160 ft they pulled the drillpipe from the hole to change bits.

The bit had been changed and about 700 ft of drillpipe had been lowered back into the wellbore when mud began bubbling out of the hole, ushering in a new era on the 10th day of the 20th century.

In seconds, 6 tons of 4 in. drillpipe, swivels, blocks, and tackle shot skyward, propelled by a highly pressured slug of drilling slurry, mud, rocks, and sand. The drillstem blasted through the top of the derrick and broke into joints as it crashed to earth around the wellhead.

For a few moments, all was silent. The drilling crew, dazed and fearful of what they had seen, crept back onto the rig floor, now strewn with thick mud and debris.

Almost immediately, mud again shot out of the wellbore, this time with a report like a cannon. A low rumble, deep within Spindletop grew to an ear-splitting roar. Gas spewed from the hole, followed by a column of oil that gushed out the top of the derrick, doubling its height before dousing everything within a wide radius around the well.

In an instant, the drudgery of drilling with the era's inefficient methods and tools was replaced with dread of controlling an awesome blowout of unprecedented volume.

Lucas responded with creativity, considering the primitive state of oil field technology. He hired gang plows and 40 four-horse teams to build levees to contain the oil. He hired guards to keep crowds away from the site. And he wired Guffey and Galey in Pittsburgh about the event, estimating the well's production at 35,000 b/d.

Other estimates of the day placed Spindletop's initial flow at about 75,000 b/d of oil. As hours passed on the first day, the uncontrolled flow increased. In 9 days, 1 Lucas, as the discovery well became known, created a lake of about 800,000 bbl of oil.

The first levees built by Lucas' gangs soon were filled and larger ones had to be built. Still 1 Lucas roared on.

On Jan. 13, a catastrophe was narrowly averted when guards and onlookers smothered a grass fire that broke out on the oil-soaked ground around the well.

Galey, Lucas, and the Hamills finally controlled 1 Lucas and shut it in Jan. 19. To protect the well from fire, they installed a large iron cylinder around the wellhead and filled it with sand.

The wisdom of the latter safety measure was proved Mar. 3, when sparks from a passing train set off a grass fire that quickly spread to engulf Spindltop's oil-filled levees. A single gigantic blaze consumed more than 500,000 bbl of Spindletop crude. But 1 Lucas was not damaged.

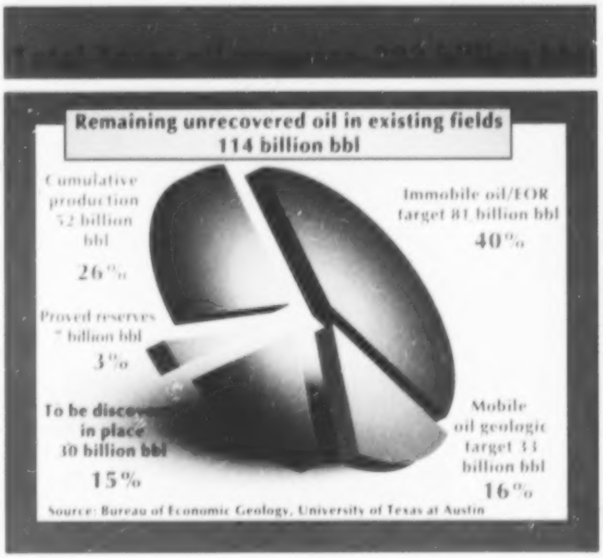
## Birth of an industry

The Lucas blowout, the largest discovery the U.S. had seen, sparked one of the country's greatest oil booms.

Contrary to prevailing opinion at the time, 1 Lucas suggested that vast volumes of oil could be recovered at relatively shallow depths from salt domes along Texas' Coastal Plain. In the decade that followed, explorationists tested scores of similar structures along the Gulf Coast in a futile search for another Spindletop.

Spindletop's oil was of poor quality for refining into kerosine for lighting, the main use of hydrocarbon fuels up to that time. Instead, its production was refined into fuel oil. As a result, a host of small Texas industrial operations converted from coal to fuel oil for heating, power, and in some cases transportation.

Coal-to-oil conversions soon followed all over the U.S. Santa Fe Railroad, for one, increased its oil-fired locomotives from one unit in 1901 to 227 in 1905. Consequently, the Lucas discovery at Spindletop is credited with transforming a nation as well as an industry by giving birth to a transportation industry powered by a seemingly unlimited supply of hydrocarbon fuels.



Source: Bureau of Economic Geology, University of Texas at Austin

The news of Spindletop transformed Beaumont, which quickly changed from a quiet rural haven of 10,000 souls to a bawdy, roaring boom town of 50,000 as hordes of sightseers, speculators, fortune hunters, and other boomers poured in from all around the world.

By many accounts, the steets of Beaumont resembled a nonstop riot, and denizens of local saloons reportedly accounted for half of the state's whisky consumption. Brawling was common enough to be considered a favored pastime, but murder was relatively rare.

Deals were cut at all hours of the day and night. Many dishonest schemers promoted phony deals and worthless stock, trumped up by false claims and inaccurate newspaper and magazine articles. So numerous were victims of fraudulent deals that local wags renamed their landmark "Swindletop."

Skyrocketing land values couldn't stem the tide of shanties, tents, lean-tos, and other rude shelters hastily erected in and around Beaumont and on Spindletop itself.

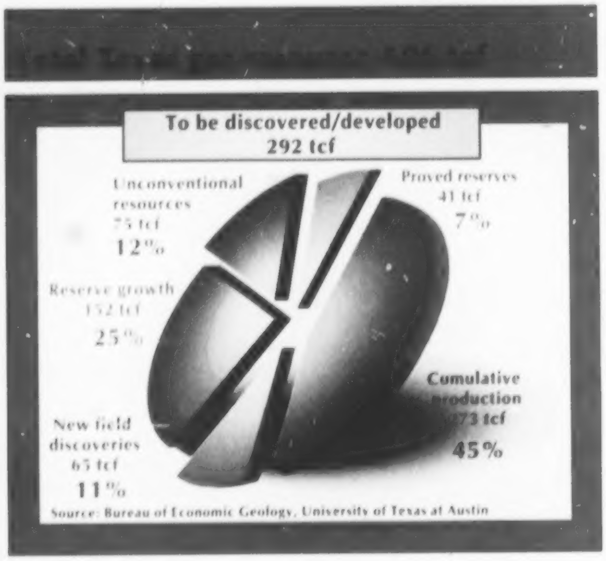
More than 400 oil and gas companies were chartered in the first year with combined capitalization of about $200 million. Included were predecessors of many major integrated U.S. firms:

- The Texas Co., founded by J.S. Cullinan and Arnold Schlaet, later became Texaco Inc.
- Humble Oil & Refining Co., which merged in 1959 with a company known today as Exxon Corp.
- Sun Co. Inc., founded in northern Ohio in 1886, quickly joined the Spindletop play and in 1902 began processing Texas crude in a refinery at Marcus Hook, Pa.
- Founded later, in 1907, Gulf Refining Oil Co., which was acquired by Chevron Corp. in 1984.

Guffey cut a deal with Shell Transport & Trading, which agreed to pay him 25¢/bbl for half his production for the next 20 years.

Among the few impediments to development, most limiting was a lack of oil field equipment and railroad cars to move products out of the area. Well productivities often were described in terms of production tubing size: 4 in. or 6 in. gushers, for example.

By the end of August 1901, more than 40 flowing wells had been completed, each a risky event. A greater danger



Source: Bureau of Economic Geology, University of Texas at Austin

however, was the practice of whetting investors' avarice by allowing wells to flow anew to demonstrate productive capacity. Promoters commonly stopped coaches jammed with investors alongside a well site and fully opened wellhead valves. A committee of Spindletop oil producers put a stop to the promotional technique with a list of safety rules, among the world's first organized attempts to control oil field hazards.

By yearend 1901:

- 138 wells had been completed at Spindletop, and more than 5 million bbl of oil was produced and gathered.
- Capital investment on oil and gas exploration and development around Beaumont totaled nearly $4 million.
- Spindletop producers held about 1.6 million bbl of oil in storage. About 3.6 million bbl had been sold for almost $631,000.

Within a year of the Lucas discovery, 285 wells were producing in Spindletop field, where wellheads were so close to each other that rig hands could step from one derrick floor to the next without setting foot on the ground.

But by the middle of 1902, hundreds of tightly packed wells had resulted in overproduction, and Spindletop production plummeted.

## Strikes across Texas

In the same way success at Corsicana had encouraged Higgins to continue pressing his vision of Spindletop's potential, the boom touched off by 1 Lucas inspired a quick succession of discoveries across Texas.

Texas petroleum industry development in the decade after Spindletop also began to focus more on gas prospects.

The state's third major oil producing area appeared in North Texas near Petrolia in Clay County, where shallow shows of oil had been found for many years. Like the discovery at Corsicana, the 1902 discovery in Clay County occurred by accident, when crews drilling for water on the Lochridge farm near Petrolia cut a productive oil sand at 150 ft.

Mission field near San Antonio was recognized as the state's fourth sizable producing area in 1907.

Meanwhile, work in Petrolia field in 1907 was credited with launching the state's gas industry. In October of that year, Navarro Refining Co. completed a gas well at 1,500 ft in the field that recorded 475 psi surface pressure.

Gas from Navarro Refining's well and three others soon was being piped to Petrolia and to Wichita Falls in Southeast Wichita County. Based on the success of that project, on June 4, 1909, a group led by L.B. Denning filed a charter to organize Lone Star Gas Co. for the purpose of laying a gas pipeline to transport gas from Clay County to Dallas and Fort Worth. Lone Star became the state's first major gas company.

By spring 1910, Dallas, Fort Worth, and several smaller communities in the area were receiving gas through the Lone Star line.

## Sustained expansion

Scores of oil and gas discoveries were recorded across Texas during 1911-20, a period of sustained expansion for the state's petroleum industry.

Among the most noteworthy finds:

- In July 1918 in Liberty County, Southeast Texas, 3 Fee well by Republic Production Co. and Houston Oil Co. of Texas proved the Hull salt dome productive.
- During the same month in North Texas, the Fowler well on the edge of Burkburnett in Wichita County found oil, touching off a boom in which stock speculation reportedly rivaled or surpassed the excesses at Spindletop.
- Amarillo Oil Co. on Sept. 1, 1918, cut gas pay above 2,300 ft in the Texas Panhandle, opening the region to development. Upon completion Dec. 9, 1 Masterson flowed 10 MMcfd of gas. Oil development in the Panhandle was delayed until a discovery in 1921.

The decade also was marked in 1917 by the first widespread labor dispute when members of the Oil Field Workers' Union of South Texas and Louisiana on called a strike Nov. 1 to demand shorter hours, better pay, and recognition of the union.

The walkout briefly halted some operations, but by the end of November soldiers were occupying all major Texas oil and gas fields, and order prevailed. However, neither side showed a willingness to compromise on the issues.

The Federal Mediation Commission dispatched a mediator to try to find grounds for settling the disagreement. In January 1918, more than 200 Texas and Louisiana operators meeting in Houston organized the Texas Gulf Coast and Louisiana Oil and Producers Association to consider solutions recommended by the commission. And by the end of the year, Texas oil and gas activity had returned to normal.

## Regulatory framework

Prompted by problems caused by many haphazard development programs across the state early in the 20th century, the Texas Legislature began expanding state authority over oil and gas.

By Oct. 9, 1930, when Dad Joiner's 3 Daisy Bradford wildcat found oil in Rusk County, marking discovery of East Texas field and undermining world oil prices with a flood of new supplies, much of the regulatory framework needed for efficient oil field operations had been put in place.

However, enforcing state conservation law on a generally resistive industry was another matter.

Texas legislators passed the first law giving the Texas Railroad Commission (TRC) authority to enforce the state's oil and gas conservation laws with a 1917 act that declared pipelines common carriers.

In 1919, state legislators created the commission's oil and gas division and continued delegating to the TRC authority to oversee oil field activity in the state by passing a law mandating conservation and forbiding waste of Texas oil and gas resources.

In June 1920, the legislature declared production and sale of gas a public utility and placed TRC in charge.

A law passed in March 1929 set conditions under which pipelines could be built in or through Texas to deliver

# International Active Rig Count

| Region | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | | | 1990 | | | 1991 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Land | Off. | Total | Land | Off. | Total | Land | Off. | Total |
| **NORTH AMERICA** | | | | | | | | | | | | | | |
| Canada | 259 | 311 | 178 | 181 | 196 | 129 | 1 | 130 | 138 | 0 | 138 | 120 | 1 | 121 |
| United States* | 2,428 | 1,980 | 964 | 936 | 936 | 746 | 123 | 869 | 902 | 108 | 1,010 | 762 | 98 | 860 |
| **Subtotal** | **2,687** | **2,291** | **1,142** | **1,117** | **1,132** | **875** | **124** | **999** | **1,040** | **108** | **1,148** | **882** | **99** | **981** |
| **LATIN AMERICA** | | | | | | | | | | | | | | |
| Argentina | 82 | 81 | 47 | 61 | 63 | 54 | 1 | 55 | 63 | 1 | 64 | 60 | 0 | 60 |
| Bolivia | 6 | 5 | 4 | 6 | 5 | 6 | 0 | 6 | 6 | 0 | 6 | 10 | 0 | 10 |
| Brazil | 70 | 76 | 77 | 60 | 39 | 21 | 7 | 28 | 16 | 7 | 23 | 14 | 7 | 21 |
| Chile | 6 | 6 | 6 | 7 | 5 | 3 | 2 | 5 | 3 | 3 | 6 | 3 | 3 | 6 |
| Colombia | 16 | 21 | 17 | 14 | 19 | 15 | 0 | 15 | 11 | 0 | 11 | 9 | 0 | 9 |
| Costa Rica | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ecuador | 4 | 2 | 3 | 3 | 6 | 5 | 0 | 5 | 2 | 0 | 2 | 7 | 0 | 7 |
| Mexico | 196 | 196 | 163 | 143 | 155 | 69 | 34 | 103 | 57 | 33 | 90 | 76 | 33 | 109 |
| Peru | 17 | 12 | 13 | 15 | 11 | 6 | 4 | 10 | 4 | 2 | 6 | 2 | 1 | 3 |
| Trinidad | 9 | 10 | 11 | 9 | 7 | 2 | 4 | 6 | 3 | 5 | 8 | 2 | 4 | 6 |
| Venezuela | 30 | 33 | 29 | 18 | 25 | 18 | 10 | 28 | 20 | 12 | 32 | 28 | 17 | 45 |
| Other | 3 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Subtotal** | **440** | **444** | **371** | **338** | **335** | **199** | **62** | **261** | **185** | **63** | **248** | **211** | **65** | **276** |
| **FAR EAST** | | | | | | | | | | | | | | |
| Australia | 34 | 31 | 15 | 16 | 19 | 7 | 7 | 14 | 8 | 6 | 14 | 7 | 5 | 12 |
| Bangladesh | 4 | 5 | 5 | 5 | 2 | 4 | 1 | 5 | 4 | 0 | 4 | 0 | 0 | 0 |
| Brunei | 9 | 7 | 5 | 3 | 4 | 1 | 3 | 4 | 1 | 4 | 5 | 1 | 3 | 4 |
| China-offshore | 9 | 14 | 7 | 4 | 8 | 0 | 4 | 4 | 0 | 3 | 3 | 0 | 2 | 2 |
| India | 57 | 62 | 70 | 116 | 131 | 110 | 25 | 135 | 110 | 27 | 137 | 114 | 22 | 136 |
| Indonesia | 82 | 80 | 62 | 37 | 44 | 36 | 10 | 46 | 36 | 16 | 52 | 39 | 14 | 53 |
| Japan | 18 | 16 | 15 | 10 | 11 | 6 | 0 | 6 | 6 | 1 | 7 | 5 | 1 | 6 |
| Malaysia | 9 | 8 | 8 | 8 | 9 | 1 | 11 | 12 | 0 | 13 | 13 | 0 | 13 | 13 |
| Myanmar (Burma) | 33 | 33 | 33 | 29 | 26 | 23 | 0 | 23 | 19 | 0 | 19 | 22 | 0 | 22 |
| New Zealand | 2 | 4 | 4 | 3 | 2 | 2 | 0 | 2 | 0 | 1 | 1 | 1 | 0 | 1 |
| Papua New Guinea | 1 | 2 | 1 | 2 | 3 | 2 | 1 | 3 | 2 | 1 | 3 | 2 | 0 | 2 |
| Philippines | 3 | 2 | 1 | 2 | 4 | 6 | 1 | 7 | 6 | 0 | 6 | 4 | 1 | 5 |
| Taiwan | 6 | 7 | 7 | 4 | 4 | 4 | 1 | 5 | 2 | 1 | 3 | 2 | 1 | 3 |
| Thailand | 11 | 9 | 4 | 6 | 6 | 3 | 3 | 6 | 2 | 3 | 5 | 1 | 3 | 4 |
| Other | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| **Subtotal** | **278** | **280** | **237** | **245** | **274** | **205** | **68** | **273** | **196** | **77** | **273** | **198** | **65** | **263** |
| **AFRICA** | | | | | | | | | | | | | | |
| Algeria | 27 | 35 | 41 | 40 | 32 | 24 | 0 | 24 | 35 | 0 | 35 | 31 | 0 | 31 |
| Angola | 7 | 11 | 7 | 10 | 10 | 1 | 7 | 8 | 1 | 7 | 8 | 0 | 6 | 6 |
| Congo | 3 | 3 | 2 | 3 | 2 | 0 | 1 | 1 | 0 | 2 | 2 | 1 | 2 | 3 |
| Gabon | 6 | 7 | 3 | 3 | 5 | 3 | 3 | 6 | 3 | 2 | 5 | 3 | 2 | 5 |
| Kenya | 0 | 0 | 0 | 1 | 1 | 3 | 0 | 3 | 1 | 0 | 1 | 0 | 0 | 0 |
| Libya | 26 | 30 | 20 | 12 | 16 | 13 | 4 | 17 | 12 | 3 | 15 | 14 | 1 | 15 |
| Nigeria | 11 | 10 | 10 | 11 | 13 | 10 | 4 | 14 | 12 | 6 | 18 | 8 | 13 | 21 |
| South Africa | 2 | 3 | 3 | 3 | 4 | 0 | 3 | 3 | 0 | 3 | 3 | 1 | 1 | 2 |
| Tunisia | 6 | 4 | 3 | 4 | 3 | 3 | 0 | 3 | 2 | 1 | 3 | 4 | 2 | 6 |
| Other | 18 | 16 | 7 | 4 | 5 | 2 | 2 | 4 | 2 | 0 | 2 | 0 | 0 | 0 |
| **Subtotal** | **106** | **119** | **96** | **91** | **91** | **59** | **24** | **83** | **68** | **24** | **92** | **62** | **27** | **89** |
| **EUROPE** | | | | | | | | | | | | | | |
| Austria | 7 | 7 | 6 | 4 | 4 | 2 | 0 | 2 | 1 | 0 | 1 | 2 | 0 | 2 |
| Denmark | 3 | 4 | 3 | 3 | 2 | 0 | 2 | 2 | 0 | 2 | 2 | 0 | 2 | 2 |
| France | 20 | 22 | 15 | 8 | 8 | 7 | 0 | 7 | 6 | 0 | 6 | 4 | 0 | 4 |
| Germany | 19 | 20 | 19 | 12 | 9 | 8 | 0 | 8 | 8 | 1 | 9 | 7 | 0 | 7 |
| Greece | 4 | 1 | 0 | 2 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Holland | 18 | 24 | 15 | 10 | 14 | 4 | 8 | 12 | 3 | 11 | 14 | 3 | 8 | 11 |
| Hungary | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 4 | 0 | 4 |
| Italy | 26 | 40 | 33 | 26 | 24 | 17 | 5 | 22 | 16 | 5 | 21 | 19 | 6 | 25 |

## *International Active Rig Count—continued*

| Region | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 Land | 1989 Off. | 1989 Total | 1990 Land | 1990 Off. | 1990 Total | 1991 Land | 1991 Off. | 1991 Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Norway | 10 | 13 | 12 | 12 | 15 | 0 | 12 | 12 | 0 | 12 | 12 | 0 | 16 | 16 |
| Poland | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 22 | 0 | 22 |
| Spain | 9 | 10 | 7 | 2 | 2 | 1 | 2 | 3 | 1 | 0 | 1 | 0 | 1 | 1 |
| Turkey | 24 | 25 | 27 | 26 | 21 | 20 | 0 | 20 | 17 | 0 | 17 | 19 | 0 | 19 |
| United Kingdom | 60 | 63 | 43 | 44 | 57 | 4 | 42 | 46 | 2 | 46 | 48 | 1 | 38 | 39 |
| Yugoslavia | 25 | 27 | 30 | 31 | 31 | 29 | 3 | 32 | 30 | 1 | 31 | 15 | 0 | 15 |
| Other | 2 | 2 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| **Subtotal** | **227** | **258** | **211** | **181** | **190** | **93** | **74** | **167** | **84** | **78** | **162** | **97** | **71** | **168** |
| **MIDDLE EAST** | | | | | | | | | | | | | | |
| Abu Dhabi | 29 | 21 | 15 | 9 | 7 | 2 | 4 | 6 | 4 | 5 | 9 | 6 | 7 | 13 |
| Dubai | 7 | 5 | 3 | 2 | 3 | 0 | 3 | 3 | 0 | 3 | 3 | 1 | 2 | 3 |
| Egypt | 36 | 37 | 33 | 23 | 21 | 6 | 12 | 18 | 6 | 9 | 15 | 9 | 8 | 17 |
| Iran | 20 | 20 | 18 | 18 | 18 | 20 | 0 | 20 | 19 | 0 | 19 | 20 | 1 | 21 |
| Iraq† | 19 | 28 | 21 | 10 | 23 | 26 | 0 | 26 | 23 | 0 | 23 | N/A | N/A | N/A |
| Jordan | 3 | 2 | 2 | 2 | 2 | 3 | 0 | 3 | 2 | 0 | 2 | 2 | 0 | 2 |
| Kuwait† | 5 | 6 | 6 | 6 | 6 | 4 | 0 | 4 | 2 | 0 | 2 | 1 | 0 | 1 |
| Oman | 12 | 13 | 13 | 10 | 9 | 13 | 0 | 13 | 17 | 0 | 17 | 14 | 0 | 14 |
| Pakistan | 17 | 18 | 17 | 14 | 13 | 13 | 0 | 13 | 11 | 0 | 11 | 10 | 0 | 10 |
| Qatar | 2 | 3 | 1 | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 2 | 2 | 1 | 3 |
| Saudi Arabia | 16 | 11 | 6 | 5 | 4 | 4 | 1 | 5 | 9 | 1 | 10 | 15 | 1 | 16 |
| Syria | 23 | 26 | 27 | 22 | 24 | 24 | 0 | 24 | 17 | 0 | 17 | 14 | 0 | 14 |
| Yemen | 0 | 1 | 4 | 4 | 3 | 2 | 0 | 2 | 3 | 0 | 3 | 5 | 0 | 5 |
| Other | 1 | 3 | 3 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| **Subtotal** | **190** | **194** | **169** | **127** | **136** | **119** | **22** | **141** | **115** | **19** | **134** | **99** | **20** | **119** |
| **Total** | **3,928** | **3,586** | **2,226** | **2,099** | **2,158** | **1,550** | **374** | **1,924** | **1,688** | **369** | **2,057** | **1,549** | **347** | **1,896** |

*U.S. offshore includes inland water rigs: 19 in 1989, 21 in 1990, 17 in 1991.

†1990 data for Iraq and Kuwait is average rigs January through August.

Source: Baker Hughes Inc.

## International seismic crew count

(Average crews operating)

| | 1986 Land | 1986 Marine | 1986 Total | 1987 Land | 1987 Marine | 1987 Total | 1988 Land | 1988 Marine | 1988 Total |
|---|---|---|---|---|---|---|---|---|---|
| United States | 161 | 22 | 183 | 154 | 24 | 178 | 147 | 29 | 176 |
| Canada | 53 | 1 | 54 | 58 | 1 | 59 | 69 | 1 | 70 |
| Mexico | 29 | 0 | 29 | 23 | 0 | 23 | 21 | 0 | 21 |
| Central & South America | 48 | 5 | 53 | 46 | 5 | 51 | 53 | 4 | 57 |
| Europe | 65 | 26 | 91 | 52 | 25 | 77 | 49 | 26 | 75 |
| Middle East | 33 | 4 | 37 | 35 | 3 | 38 | 42 | 2 | 44 |
| Africa | 44 | 4 | 48 | 37 | 5 | 42 | 36 | 6 | 42 |
| Far East | 74 | 9 | 83 | 87 | 9 | 96 | 75 | 11 | 86 |
| **Total** | **507** | **71** | **578** | **492** | **72** | **564** | **492** | **79** | **571** |

(Average crews operating)

| | 1989 Land | 1989 Marine | 1989 Total | 1990 Land | 1990 Marine | 1990 Total | 1991* Land | 1991* Marine | 1991* Total |
|---|---|---|---|---|---|---|---|---|---|
| United States | 109 | 22 | 131 | 102 | 23 | 125 | 88 | 23 | 111 |
| Canada | 57 | 1 | 58 | 51 | 1 | 52 | 49 | 0 | 49 |
| Mexico | 17 | 0 | 17 | 18 | 0 | 18 | 22 | 0 | 22 |
| Central & South America | 53 | 5 | 58 | 48 | 5 | 53 | 53 | 4 | 57 |
| Europe | 42 | 25 | 67 | 38 | 25 | 63 | 37 | 34 | 71 |
| Middle East | 41 | 2 | 43 | 37 | 2 | 39 | 31 | 1 | 32 |
| Africa | 46 | 8 | 54 | 50 | 7 | 57 | 43 | 9 | 52 |
| Far East | 58 | 14 | 72 | 60 | 16 | 76 | 62 | 17 | 79 |
| **Total** | **423** | **77** | **500** | **404** | **79** | **483** | **385** | **88** | **473** |

*First half.
Source: Society of Exploration Geophysicists

## Breakout of exploration/production spending*

| | 1991 (Million U.S. $) | 1990 (Million U.S. $) |
|---|---|---|
| MAJORS U.S. | | |
| Amerada Hess | 300 | 250 |
| Amoco | 835 | 900 |
| ARCO | 1,850 | 1,625 |
| BP | 1,200 | 1,100 |
| Chevron | 1,280 | 1,100 |
| Du Pont | 720 | 550 |
| Elf Aquitaine | 100 | 90 |
| Exxon | 1,470 | 1,400 |
| Mobil | 1,150 | 1,000 |
| Phillips | 309 | 349 |
| Occidental | 170 | 217 |
| Oryx | 300 | 350 |
| Pennzoil | 170 | 165 |
| Royal Dutch/Shell | 1,895 | 1,700 |
| Texaco | 900 | 1,100 |
| Total Minatome | 50 | 55 |
| Union Pacific | 355 | 370 |
| Unocal | 530 | 540 |
| USX | 525 | 550 |
| **Total** | **14,109** | **13,411** |
| **Change** | **+5.2%** | |
| SELECTED INDEPENDENTS, U.S.† | | |
| Adobe | 49 | 68 |
| AMAX | 45 | 27 |
| Anadarko | 185 | 150 |
| Apache | 127 | 124 |
| Arkla | 70 | 70 |
| Ashland | 47 | 43 |
| Berry | 20 | 14 |
| BHP | 120 | 94 |
| Bridge Oil | 31 | 10 |
| Brooklyn Union | 36 | 23 |
| Burlington Resources | 348 | 287 |
| Cabot | 45 | 40 |
| Canadian Occidental | 46 | 46 |
| Chieftain | 32 | 30 |
| Coastal | 110 | 93 |
| Coho | 23 | 34 |
| Columbia Gas | 165 | 180 |
| Consolidated Natural | 130 | 170 |
| Corpus Christi Oil & Gas | 44 | 51 |
| Dekalb Energy | 33 | 33 |
| Diversified Energies | 34 | 25 |
| Enron | 264 | 255 |
| Enserch | 197 | 117 |
| Equitable Resources | 58 | 56 |
| Forest Oil | 61 | 64 |
| Freeport-McMoRan | 185 | 185 |
| Global Natural Resources | 20 | 28 |
| Grace Energy | 36 | 26 |
| Helmerich & Payne | 27 | 17 |
| Hondo | 28 | 32 |
| Howell | 20 | 9 |
| J.M. Huber | 30 | 32 |
| Kelley Oil et al. | 50 | 25 |
| Kerr-McGee | 145 | 145 |
| Lasmo | 17 | 28 |
| Louisiana Land | 165 | 155 |
| Maxus Energy | 125 | 120 |
| Mesa | 48 | 40 |
| Mitchell Energy | 142 | 132 |
| Murphy | 47 | 42 |
| National Fuel Gas | 30 | 25 |
| Nicor | 32 | 35 |
| Noble Affiliates | 77 | 91 |
| Nomeco | 49 | 54 |
| Noranda | 41 | 59 |
| Norcen Energy | 64 | 53 |
| Odeco | 81 | 55 |
| Pacific Enterprises | 155 | 175 |
| Paramount | 20 | 12 |
| Parker & Parsley | 100 | 98 |
| Petrofina | 168 | 137 |
| Plains | 23 | 14 |
| Pogo Producing | 58 | 41 |
| Presidio | 60 | 45 |
| Public Service Enterprise | 114 | 85 |
| Questar | 43 | 50 |
| Santa Fe Energy | 119 | 97 |
| Seagull Energy | 60 | 42 |
| Sonat | 187 | 149 |
| Taylor Energy | 20 | 28 |
| Transco Coal Methane | 50 | 170 |
| Transco Exploration | 45 | 50 |
| Ultramar | 40 | 35 |
| Union Texas | 90 | 97 |
| Wainoco | 20 | 20 |
| Wolverine Exploration Co. | 18 | 28 |
| CANADA† | | |
| Alberta Energy | 121 | 121 |
| Amerada Hess | 50 | 40 |
| Amoco | 475 | 450 |
| Anderson | 51 | 64 |
| Bow Valley | 64 | 72 |
| BP Canada | 112 | 108 |
| Canadian Occidental | 26 | 26 |
| Chauvco Resources | 43 | 24 |
| Chevron | 420 | 350 |
| Columbia Gas | 30 | 34 |
| Co-Enerco | 22 | 19 |
| Dekalb Energy | 33 | 33 |
| Du Pont | 50 | 60 |
| Encor Energy | 73 | 69 |
| Enron | 28 | 27 |
| Gulf Canada | 241 | 198 |
| Imperial | 420 | 400 |
| Kerr-McGee | 35 | 35 |
| Lasmo | 102 | 42 |
| Mark Resources | 62 | 72 |
| Mobil | 300 | 200 |
| Morgan Hydrocarbons | 30 | 18 |
| Murphy | 27 | 29 |
| Noranda | 112 | 132 |
| Norcen Energy | 149 | 115 |
| North Canadian | 80 | 66 |
| Numac | 23 | 24 |
| PanCanadian | 323 | 271 |
| PanContinental | 18 | 21 |
| Poco | 63 | 55 |
| Ranchmen's Resources | 22 | 18 |
| Renaissance Energy | 138 | 112 |
| Saskatchewan Oil & Gas | 156 | 171 |
| Sceptre Resources | 71 | 45 |
| Shell Canada | 605 | 365 |
| Suncor | 73 | 60 |
| Total Petroleum NA | 38 | 32 |
| Union Pacific | 30 | 30 |
| Unocal | 85 | 75 |
| Voyager Energy | 35 | 32 |
| Westcoast Petroleum | 75 | 60 |
| OTHER INTERNATIONAL† | | |
| Amerada Hess | 400 | 310 |
| Amoco | 1,300 | 950 |
| Anadarko | 20 | 10 |
| Aran Energy | 20 | 11 |
| ARCO | 725 | 625 |
| BHP | 820 | 550 |
| Bow Valley | 139 | 99 |
| Bridge Oil | 22 | 17 |
| BP | 2,800 | 2,500 |
| Canadian Occidental | 35 | 35 |
| Chevron | 1,050 | 850 |
| Clyde Petroleum | 108 | 98 |
| Du Pont | 930 | 860 |
| Elf Aquitaine | 2,650 | 1,900 |
| Encor Energy | 26 | 30 |
| Enterprise Oil | 1,000 | 690 |
| Exxon | 2,835 | 2,700 |
| Goal Petroleum | 33 | 37 |
| Gulf Canada | 60 | 60 |
| Hamilton Oil | 250 | 141 |
| Kerr-McGee | 100 | 100 |
| Lasmo | 720 | 435 |
| Louisiana Land | 71 | 41 |
| Maxus Energy | 125 | 187 |
| Mobil | 1,100 | 875 |
| Murphy | 37 | 18 |
| Noble Affiliates | 25 | 21 |
| Nomeco | 31 | 8 |
| Norcen Energy | 53 | 34 |
| Occidental | 443 | 465 |
| Odeco | 36 | 22 |
| Oryx | 160 | 110 |
| Petrofina | 627 | 353 |
| Phillips | 318 | 202 |
| Premier Consolidated | 49 | 89 |
| Ranger Oil | 149 | 53 |
| Royal Dutch/Shell | 2,700 | 2,935 |
| Saga Petroleum | 311 | 279 |
| Sovereign Oil & Gas | 26 | 32 |
| Statoil | 1,200 | 965 |
| Sun | 126 | 100 |
| Texaco | 950 | 700 |
| Total CSB | 875 | 790 |
| Triton Energy | 54 | 54 |
| Ultramar | 200 | 190 |
| Unimar | 47 | 47 |
| Union Texas | 225 | 244 |
| Unocal | 375 | 283 |
| USX | 525 | 350 |

*Estimates for both years. †Companies spending at least $20 million in either year.

Source: Salomon Bros. Inc.

If oil prices averaged only $20/bbl in 1991, only 19% of the companies surveyed would cut their E&P budgets. If prices averaged $30/bbl in 1991, 35% of the companies surveyed would increase their budget. As it turned out, the average price didn't even approach that figure.

Canadian companies, which cited cash flow as the most critical determinant of spending, also said they would be more inclined to cut spending at a $20 price and more inclined to increase spending at a $30 price, Salomon Bros. survey determined.

# WORLDWIDE LOOK AT RESERVES AND PRODUCTION

|  | ESTIMATED PROVED RESERVES |  |  |  | OIL PRODUCTION |  |  |  |
|---|---|---|---|---|---|---|---|---|
|  | Jan 1, 1992 |  | Jan 1, 1991 |  |  |  |  |  |
| COUNTRY | Oil (1,000 bbl) | Gas (bcf) | Oil (1,000 bbl) | Gas (bcf) | Producing wells* Dec 31, 1990 | Estimated 1991 (1,000 b/d) | Change from 1990 (%) | Actual 1990 (1,000 b/d) |
| **ASIA-PACIFIC** |  |  |  |  |  |  |  |  |
| Afghanistan | ... | 3,530 | ... | 3,530 | ... | ... | ... | ... |
| Australia | 1,523,700 | 15,057 | 1,566,163 | 15,433 | 1,607 | 543.0 | −5.7 | 576.0 |
| Bangladesh | 500 | 25,600 | 500 | 12,700 | 10 | 0.9 | 0.0 | 0.9 |
| Brunei | 1,350,000 | 11,200 | 1,350,000 | 11,200 | 584 | 151.3 | 12.7 | 134.3 |
| China | 24,000,000 | 35,400 | 24,000,000 | 35,300 | 49,700 | 2,800.0 | 1.2 | 2,767.6 |
| China, Taiwan | 4,000 | 670 | 4,500 | 700 | 93 | 1.9 | −32.1 | 2.8 |
| India | 6,126,740 | 25,772 | 7,997,100 | 25,049 | 2,514 | 647.0 | −2.6 | 664.6 |
| Indonesia | 6,581,293 | 64,837 | 11,050,000 | 91,450 | 7,262 | 1,432.6 | 11.1 | 1,289.0 |
| Japan | 59,753 | 968 | 63,019 | 1,124 | 343 | 14.0 | 50.5 | 9.3 |
| Malaysia | 3,045,000 | 59,055 | 2,900,000 | 56,900 | 503 | 629.0 | 1.0 | 623.0 |
| Myanmar (Burma) | 50,000 | 9,350 | 51,000 | 9,400 | 450 | 12.0 | −7.7 | 13.0 |
| New Zealand | 170,230 | 3,449 | 209,000 | 4,106 | 51 | 40.0 | 5.3 | 38.0 |
| Pakistan | 162,000 | 22,600 | 162,087 | 19,449 | 97 | 69.5 | 12.1 | 62.0 |
| Papua New Guinea | 200,000 | 8,000 | 200,000 | 8,000 | ... | ... | ... | ... |
| Philippines | 38,000 | 100 | 38,688 | 1,800 | 11 | 3.0 | −37.5 | 4.8 |
| Thailand | 262,000 | 13,600 | 150,000 | 5,850 | 299 | 46.6 | 10.4 | 42.2 |
| Viet Nam | 500,000 | 100 | 500,000 | 100 | NA | 65.8 | 119.3 | 30.0 |
| **Total Asia-Pacific** | **44,073,216** | **299,288** | **50,242,057** | **302,091** | **63,524** | **6,456.6** | **3.2** | **6,257.5** |
| **WESTERN EUROPE** |  |  |  |  |  |  |  |  |
| Austria | 84,984 | 388 | 81,443 | 403 | 1,242 | 25.9 | 19.4 | 21.7 |
| Denmark | 755,000 | 4,059 | 799,435 | 4,488 | 98 | 140.4 | 16.3 | 120.7 |
| France | 170,836 | 1,296 | 184,766 | 1,324 | 647 | 58.5 | −4.4 | 61.2 |
| Germany | 449,000 | 8,760 | 425,000 | 12,400 | 2,100 | 74.3 | −3.6 | 77.1 |
| Greece | 41,000 | 44 | 30,000 | 47 | 13 | 15.3 | −6.7 | 16.4 |
| Ireland | ... | 1,700 | ... | 1,700 | ... | ... | ... | ... |
| Italy | 692,153 | 11,370 | 693,503 | 11,624 | 222 | 89.5 | −4.8 | 94.0 |
| Netherlands | 144,650 | 69,570 | 157,200 | 60,900 | 187 | 66.3 | −5.7 | 70.3 |
| Norway | 7,609,400 | 60,670 | 7,609,412 | 60,674 | 308 | 1,864.0 | 15.0 | 1,620.5 |
| Spain | 21,389 | 740 | 20,000 | 780 | 44 | 21.3 | 31.5 | 16.2 |
| Turkey | 540,450 | 705 | 650,000 | 1,150 | 684 | 86.7 | 20.1 | 72.2 |
| United Kingdom | 3,994,310 | 19,247 | 3,825,000 | 19,775 | 880 | 1,779.3 | −3.8 | 1,849.7 |
| **Total Western Europe** | **14,503,172** | **178,549** | **14,475,759** | **175,265** | **6,425** | **4,221.5** | **5.0** | **4,020.0** |
| **EASTERN EUROPE & U.S.S.R.** |  |  |  |  |  |  |  |  |
| Albania | 165,000 | 670 | 165,000 | 700 | NA | 30.0 | −25.0 | 40.0 |
| Bulgaria | 15,000 | 250 | 15,000 | 250 | NA | 4.0 | 0.0 | 4.0 |
| Czechoslovakia | 15,000 | 490 | 15,000 | 490 | NA | 3.0 | 0.0 | 3.0 |
| Hungary | 158.500 | 3,758 | 220,000 | 4,320 | NA | 39.0 | −2.5 | 40.0 |
| Poland | 30,000 | 4,590 | 30,000 | 5,640 | NA | 2.0 | 0.0 | 2.0 |
| Romania | 1.150,000 | 3,700 | 1,170,000 | 4,700 | NA | 130.0 | −18.8 | 160.0 |
| U.S.S.R. | 57,000,000 | 1,750,000 | 57,000,000 | 1,600,000 | 148,900 | 10,260.0 | −9.9 | 11,390.0 |
| Yugoslavia | 240,000 | 2,900 | 240,000 | 2,900 | 1,645 | 56.3 | −11.9 | 63.9 |
| **Total Eastern Europe & U.S.S.R.** | **58,773,500** | **1,766,358** | **58,855,000** | **1,619,000** | **150,545** | **10,524.3** | **−10.1** | **11,702.9** |
| **MIDDLE EAST** |  |  |  |  |  |  |  |  |
| Abu Dhabi | 92,200,000 | 182,800 | 92,200,000 | 182,800 | 1,001 | 1,945.8 | 16.7 | 1,667.0 |
| Bahrain | 83,490 | 6,010 | 97,460 | 6,250 | 317 | 38.2 | −0.3 | 38.3 |
| Dubai | 4,000,000 | 4,600 | 4,000,000 | 4,800 | 150 | 434.0 | 3.0 | 421.4 |
| Iran | 92,860,000 | 600,350 | 92,850,000 | 600,350 | 361 | 3,342.0 | 2.8 | 3,252.0 |
| Iraq | 100,000,000 | 95,000 | 100,000,000 | 95,000 | 820 | 280.0 | −86.5 | 2,080.0 |
| Israel | 1,289 | 10 | 1,400 | 10 | 12 | 0.2 | 0.0 | 0.2 |
| Jordan | 5,000 | 100 | 20,000 | 400 | 4 | 0.3 | 0.0 | 0.3 |
| Kuwait | 94,000,000 | 48,000 | 94,525,000 | 48,600 | 363 | 126.3 | −88.3 | 1,079.0 |
| Neutral Zone | 5,000,000 | 1,000 | 5,000,000 | 10,000 | 499 | 129.7 | −58.4 | 312.0 |
| Oman | 4,250,000 | 9,900 | 4,300,000 | 7,200 | 1,237 | 705.0 | 4.1 | 677.0 |
| Qatar | 3,729,000 | 162,000 | 4,500,000 | 163,200 | 238 | 390.0 | −1.0 | 394.0 |
| Ras al Khaimah | 400,000 | 1,200 | 400,000 | 2,000 | 7 | 0.8 | 0.0 | 0.8 |
| Saudi Arabia | 257,842,000 | 184,048 | 257,504,000 | 180,355 | 1,235 | 8,157.7 | 30.4 | 6,257.6 |
| Sharjah | 1,500,000 | 10,700 | 1,500,000 | 10,800 | 20 | 24.7 | −10.5 | 27.6 |
| Syria | 1,700,000 | 6,400 | 1,700,000 | 5,500 | 963 | 473.0 | 21.9 | 388.0 |
| Yemen | 4,000,000 | 7,000 | 4,000,000 | 7,000 | 87 | 200.8 | 6.1 | 189.3 |
| **Total Middle East** | **661,570,779** | **1,319,118** | **662,597,860** | **1,324,265** | **7,314** | **16,248.5** | **−3.2** | **16,784.5** |

| | ESTIMATED PROVED RESERVES | | | | OIL PRODUCTION | | | |
|---|---|---|---|---|---|---|---|---|
| | Jan 1, 1992 | | Jan 1, 1991 | | | | | |
| COUNTRY | Oil (1,000 bbl) | Gas (bcf) | Oil (1,000 bbl) | Gas (bcf) | Producing wells* Dec 31, 1990 | Estimated 1991 (1,000 b/d) | Change from 1990 (%) | Actual 1990 (1,000 b/d) |
| **AFRICA** | | | | | | | | |
| Algeria | 9,200,000 | 116,500 | 9,200,000 | 114,700 | 920 | 798.0 | 0.5 | 794.0 |
| Angola | 1,818,173 | 1,800 | 2,074,000 | 1,800 | 428 | 493.3 | 4.8 | 470.8 |
| Benin | 19,900 | ... | 100,000 | ... | 8 | 4.0 | 2.6 | 3.9 |
| Cameroon | 400,000 | 3,880 | 400,000 | 3,880 | 175 | 151.5 | -5.9 | 161.0 |
| Congo | 830,000 | 2,600 | 830,000 | 2,580 | 327 | 155.5 | 0.3 | 155.0 |
| Egypt | 4,500,000 | 12,400 | 4,500,000 | 12,400 | 907 | 885.0 | 1.5 | 872.0 |
| Equatorial Guinea | ... | 840 | ... | 840 | ... | ... | ... | ... |
| Ethiopia | ... | 880 | ... | 880 | ... | ... | ... | ... |
| Gabon | 730,000 | 450 | 730,000 | 490 | 310 | 294.7 | 8.9 | 270.7 |
| Ghana | 500 | ... | 500 | ... | ... | ... | ... | ... |
| Ivory Coast | 100,000 | 3,500 | 100,000 | 3,500 | 13 | 2.0 | 0.0 | 2.0 |
| Libya | 22,800,000 | 43,000 | 22,800,000 | 43,000 | 712 | 1,500.0 | 9.2 | 1,374.0 |
| Madagascar | ... | 70 | ... | 70 | ... | ... | ... | ... |
| Morocco | 2,139 | 43 | 2,000 | 53 | 12 | 0.9 | 0.0 | 0.9 |
| Mozambique | ... | 2,290 | ... | 2,290 | ... | ... | ... | ... |
| Namiba | ... | 2,100 | ... | 2,000 | ... | ... | ... | ... |
| Nigeria | 17,899,820 | 104,720 | 17,100,000 | 87,400 | 1,574 | 1,857.3 | 2.6 | 1,810.9 |
| Rwanda | ... | 2,000 | ... | 2,000 | ... | ... | ... | ... |
| Somalia | ... | 210 | ... | 210 | ... | ... | ... | ... |
| South Africa | ... | 1,800 | ... | 1,760 | ... | ... | ... | ... |
| Sudan | 300,000 | 3,000 | 300,000 | 3,000 | ... | ... | ... | ... |
| Tanzania | ... | 4,100 | ... | 4,100 | ... | ... | ... | ... |
| Tunisia | 1,700,000 | 3,000 | 1,700,000 | 3,000 | 159 | 104.8 | 13.3 | 92.5 |
| Zaire | 187,000 | 1,058 | 55,640 | 30 | 121 | 28.4 | -2.4 | 29.1 |
| **Total Africa** | **60,487,532** | **310,241** | **59,892,140** | **289,983** | **5,666** | **6,275.4** | **4.0** | **6,036.8** |
| **WESTERN HEMISPHERE** | | | | | | | | |
| Argentina | 1,569,987 | 20,449 | 2,280,000 | 27,000 | 10,305 | 487.3 | 1.2 | 481.3 |
| Barbados | 3,337 | 6 | 3,083 | 6 | 93 | 1.2 | 0.0 | 1.2 |
| Bolivia | 119,000 | 4,500 | 119,182 | 4,149 | 305 | 22.3 | 6.2 | 21.0 |
| Brazil | 2,800,349 | 4,046 | 2,840,000 | 4,045 | 6,267 | 635.8 | 0.4 | 633.0 |
| Canada | 5,587,798 | 96,734 | 5,782,949 | 97,589 | 39,159 | 1,523.3 | 0.3 | 1,518.0 |
| Chile | 300,000 | 4,100 | 300,000 | 4,100 | 331 | 17.8 | -11.0 | 20.0 |
| Colombia | 1,935,200 | 3,889 | 2,000,000 | 4,500 | 3,740 | 439.2 | -0.2 | 440.0 |
| Cuba | 100,000 | 100 | 100,000 | 100 | NA | 15.0 | 0.0 | 15.0 |
| Ecuador | 1,550,000 | 3,885 | 1,420,000 | 3,950 | 947 | 292.6 | 2.3 | 286.0 |
| Guatemala | 34,797 | 10 | 36,205 | 10 | 15 | 3.8 | -2.6 | 3.9 |
| Mexico | 51,298,000 | 71,508 | 51,983,000 | 72,744 | 4,740 | 2,777.0 | 4.9 | 2,648.0 |
| Peru | 382,181 | 7,075 | 405,937 | 7,082 | 3,299 | 116.2 | -11.6 | 131.4 |
| Suriname | 37,600 | ... | 27,300 | ... | 153 | 4.1 | 5.1 | 3.9 |
| Trinidad & Tobago | 535,000 | 8,900 | 536,000 | 8,910 | 3,203 | 144.9 | -3.9 | 150.8 |
| Venezuela | 59,100,000 | 110,000 | 59,040,000 | 105,688 | 8,425 | 2,341.3 | 12.3 | 2,084.5 |
| United States | 26,250,000 | 169,300 | 26,177,000 | 166,208 | 597,320 | 7,371.4 | 0.2 | 7,355.3 |
| **Total Western Hemisphere** | **151,603,249** | **504,502** | **153,050,656** | **506,081** | **678,302** | **16,193.2** | **2.5** | **15,793.3** |
| **TOTAL WORLD** | **991,011,448** | **4,378,056** | **999,113,472** | **4,216,685** | **911,776** | **59,919.5** | **-1.1** | **60,595.0** |
| **Total OPEC** | **769,392,113** | **1,733,090** | **773,819,000** | **1,744,583** | **24,844** | **23,347.5** | **-0.2** | **23,400.5** |

EDITOR'S NOTE: All reserves figures except those for the U.S.S.R. (and gas for Canada) are reported as proved reserves recoverable with present technology and prices. U.S.S.R. figures are "explored reserves" which include proved, probable, and some possible. Canadian gas figure, under criteria adopted by Canadian Petroleum Association in 1980, includes proved and some probable. *Does not include shut in, injection, or service wells.

# Worldwide Production

• Offshore (e) Estimated (c) Condensate (NA) Not available

**WORLDWIDE PRODUCTION**

| | | | | — No. of wells — | | —— Production —— | | |
|---|---|---|---|---|---|---|---|---|
| | | Name of field, discovery date | Depth, ft | Producing | Total | 1980 average b/d | Cumulative to Dec. 31, 1980 bbl | °API gravity |
| **ABU DHABI(e)** | ADNOC, OTHERS | Asab, 1965 | 8,000-8,700 | 106 | 248 | 1,667,000 | 9,999,761,800 | 40.8 |
| | | Bab, 1958 | 8,600-9,300 | 100 | 232 | | | 40.6 |
| | | Bu Hasa, 1962 | 8,300-9,200 | 201 | 371 | | | 39.0 |
| | | Sahil, 1967 | 9,500-9,800 | 22 | 52 | | | 39.7 |
| | | • Umm Shaif, 1958 | 9,800-12,000 | 142 | 203 | | | 37.0 |
| | | • Zakum Lower, 1963 | 8,000-9,000 | 131 | 254 | | | 39.0 |
| | | • Zakum Upper, 1963 | 7,000-8,000 | 142 | 262 | | | 35.0 |
| | | • Umm Addalkh, 1969 | 7,700-8,500 | 32 | 54 | | | 32.5 |
| | | • Satah, 1975 | 8,550-9,500 | 10 | 21 | | | 39.8 |
| | | • Arzanah, 1973 | 11,000-11,300 | 14 | 34 | | | 44.6 |
| | | • Abu Al Bukhoosh, 1969 | 8,900-10,900 | 42 | 48 | | | 32.0 |
| | | • Mubarraz, 1969 | 8,300-10,000 | 28 | 28 | | | 37.0 |
| | | • Bunduq, 1964 | 9,400-10,900 | 23 | 40 | | | 40.0 |
| | | **Total Abu Dhabi** | | 1,001 | 1,863 | 1,667,000 | 9,999,761,800 | |
| **ALGERIA(e)** | SONATRACH | Zarzaitine, 1957 | 4,700 | 920 | 920 | 794,000 | 8,322,776,000 | 42.2 |
| | | Edjeleh, 1956 | 1,500-2,800 | | | | | 37.2 |
| | | Tiguentourine, 1966 | 2,160-4,265 | | | | | 44.4 |
| | | El Adeb Lareche, 1958 | 4,100 | | | | | 43.3 |
| | | Assakaifaf N. & S., 1958 | 2,800 | | | | | 42.7 |
| | | Tan Emellel N. & S., 1960 | 2,800-4,500 | | | | | 42.5 |
| | | Edeyen, 1964 | 5,580 | | | | | 41.5 |
| | | Hassi Mazoula S., 1963 | 4,430 | | | | | 40.2 |
| | | Hassi Mazoula B., 1965 | 4,920 | | | | | 42.0 |
| | | Acheb W. & Kreb, 1963 & 1960 | 7,360 | | | | | 45.6 |
| | | Tin Fouye N. + F6, 1962 | 4,265 | | | | | 39.6 |
| | | El Borma, 1967 | 8,200 | | | | | 42.9 |
| | | Keskassa, 1968 | 8,860 | | | | | 42.9 |
| | | Mereksen, 1974 | 9,420 | | | | | 45.8 |
| | | Gara, 1962 | 9,420 | | | | | 42.9 |
| | | Hassi Messaoud N., 1956 | 10,500 | | | | | 45.9 |
| | | Hassi Messaoud S., 1956 | 10,500 | | | | | 46.1 |
| | | Gassi-Touil & Gassi-Touil E., 1961 | 6,890 | | | | | 50.6-50.8 |
| | | Hassi Chergui | 8,200 | | | | | 50.6 |
| | | Nezla N., 1965 | 8,530 | | | | | 51.5 |
| | | Rhourde El Baguel, 1962 | 9,850 | | | | | 40.2 |
| | | Mesdar E. & W., 1972 | 11,155 | | | | | 40.3 |
| | | El Gassi-El Agreb, 1959 | 10,170 | | | | | 47.9 |
| | | Rhourde Nouss & E., 1972 | 8,530 | | | | | 39.7 |
| | | Tin Foye Tabankort, 1966 | 4,600-6,560 | | | | | 41.1-41.3 |
| | | Djoua W., 1967 | 5,580-6,240 | | | | | 41.1 |
| | | Amassak, 1970 | 6,565 | | | | | 41.1 |
| | | Tamendjelt, 1970 | 5,585-6,890 | | | | | 41.1 |
| | | Timedratine, 1964 | 8,155 | | | | | 42.7 |
| | | Ohanet N. & S., 1960 | 7,878 | | | | | 43.8 |
| | | Askarene, 1962 | 8,200 | | | | | 41.7 |
| | | Guelta, 1962 | 8,960 | | | | | 41.7 |
| | | Stah, 1971 | 9,515 | | | | | 45.8 |
| | | Ras Toumb, 1976 | 9,190 | | | | | 35.7 |
| | | Haoud Berkaoui-Ben Kahla, 1965 | 11,000 | | | | | 43.6 |
| | | Guellala-Guellala N.E., 1969 | 11,320 | | | | | 42.2-42.3 |
| | | N'Goussa, 1974 | 11,715 | | | | | 42.2 |
| | | Kef El Argoub, 1973 | 12,570 | | | | | 42.2 |
| | | Oued Noumer, 1969 | 8,860 | | | | | 48.3 |
| | | Djorf, 1974 | 9,025 | | | | | 48.3 |
| | | Djebel Onk, 1960 | 3,940 | | | | | 37.0 |
| | | Alrar FJT | ... | | | | | ... |
| | | Hassi R'Mel(c) | ... | | | | | ... |
| | | Gassi Touil(c) | ... | | | | | ... |
| | | **Total Algeria** | | 920 | 920 | 794,000 | 8,322,776,000 | |
| **ANGOLA** | FINA ANGOLA | Benfica, 1955 | 8,300 | 1 | 5 | 23 | 2,284,000 | 30.0 |
| | | Bento, 1972 | 7,350 | 1 | 3 | 207 | 5,152,000 | 36.0 |
| | | C. Cobra, 1969 | 4,000 | ... | 11 | 337 | 3,791,000 | 41.0 |
| | | Cacuaco, 1958 | 7,870 | 1 | 4 | 15 | 285,000 | 30.0 |
| | | Galinda, 1959 | 7,220 | ... | 8 | ... | 2,245,000 | 30.0 |
| | | Genda, 1975 | 5,000 | 9 | 9 | 4,720 | 8,506,000 | 36.0 |
| | | Legua, 1972 | 6,300 | 1 | 1 | 102 | 770,000 | 31.0 |
| | | Luango, 1977 | 3,800 | 3 | 3 | 937 | 2,948,000 | 38.0 |

| | | | | No. of wells | | Production | | |
|---|---|---|---|---|---|---|---|---|
| | | Name of field, discovery date | Depth, ft | Producing | Total | 1990 average b/d | Cumulative to Dec. 31, 1990 bbl | °API gravity |
| | | Lumueno, 1977 | 4,600 | 9 | 12 | 2,490 | 5,612,000 | 37.0 |
| | | Mulenvos, 1966 | 5,900-6,600 | 5 | 12 | 196 | 5,221,000 | 25.0 |
| | | N'Z Kitona S & D, 1973 | 5,200-5,670 | 7 | 7 | 2,703 | 17,965,000 | 30.4 |
| | | N'Z Pangala, 1973 | 4,997-5,095 | 8 | 13 | 3,934 | 49,817,000 | 36.1 |
| | | N'Zombo, 1973 | 5,000-6,300 | 11 | 14 | 1,808 | 27,324,000 | 33.0 |
| | | Pambo, 1982 | 4,600 | 4 | 5 | 822 | 2,439,000 | 39.0 |
| | | Pinda, 1966 | 6,709 | ... | 1 | ... | 3,000 | 26.0 |
| | | Quenguela, 1968 | 6,000 | 20 | 32 | 1,008 | 38,256,000 | 31.0 |
| | | Quinfuquena, 1975 | 6,800-7,100 | 12 | 19 | 3,239 | 27,428,000 | 32.0 |
| | | Quinguila, 1972 | 3,400 | 20 | 30 | 6,979 | 38,805,000 | 36.0 |
| | | Sereia, 1974 | 6,200 | 3 | 4 | 791 | 1,737,000 | 27.0 |
| | | Tobias, 1961 | 1,970 | 1 | 10 | 49 | 28,881,000 | 31.0 |
| | CHEVRON | • Kali, 1969 | 11,400-11,660 | 1 | 1 | 30 | 4,345,226 | 30.0 |
| | | • Kambala, 1971 | 10,500 | 4 | 5 | 4,997 | 23,602,197 | 32.8 |
| | | • Kungulo, 1975 | 4,000 | 16 | 17 | 8,984 | 53,475,618 | 32.2 |
| | | • Lifuma, 1984 | 7,800 | 1 | 1 | 81 | 234,864 | 31.4 |
| | | • Limba, 1969 | 2,660-7,350 | 13 | 15 | 12,105 | 97,090,800 | 31.6 |
| | | • Livuite, 1979 | 8,000 | 5 | 7 | 370 | 2,931,500 | 31.7 |
| | | • Malongo North, 1966 | 1,170-9,250 | 59 | 73 | 15,817 | 26,599,993 | 30.0 |
| | | • Malongo South, 1966 | 1,150-1,440 | 27 | 33 | 7,109 | 80,403,853 | 28.0 |
| | | • Malongo West, 1969 | 1,680-8,800 | 20 | 42 | 20,115 | 251,933,141 | 22.5 |
| | | • Numbi, 1980 | 3,446 | 23 | 33 | 53,211 | 55,763,667 | 34.0 |
| | | • Takula, 1971 | 3,070-9,090 | 62 | 73 | 93,285 | 269,720,446 | 31.5 |
| | | • Vuko, 1983 | 3,700 | 6 | 6 | 3,521 | 13,860,233 | 35.0 |
| | | • Wamba, 1982 | 2,700 | 6 | 7 | 23,195 | 38,610,909 | 29.0 |
| | TEXACO-SONANGOL-TOTAL-BRASPETRO | • Cuntala, 1978 | 7,200 | ... | 1 | ... | 2,265,701 | 31.0 |
| | | • Essungo, 1975 | 6,500 | 7 | 10 | 3,646 | 23,505,296 | 35.0 |
| | | • Lombo Este, 1983 | 7,800 | 9 | 10 | 26,649 | 22,935,746 | 41.0 |
| | | • Sulele Oeste, 1985 | 7,600 | 6 | 8 | 3,280 | 3,839,306 | 41.0 |
| | | • Sulele South 1, 1986 | 7,600 | 1 | 2 | 1,312 | 1,562,023 | 39.0 |
| | | • Tuberão, 1984 | 7,600 | 6 | 8 | 11,362 | 11,855,545 | 41.0 |
| | ELF ANGOLA | • Pacassa, 1982 | 11,500 | 14 | 25 | 62,400 | 87,637,500 | 36.0 |
| | | • Palanca, 1981 | 8,860 | 13 | 21 | 46,050 | 89,242,500 | 40.0 |
| | | Bisfala, 1982 | 10,500 | 6 | 6 | 20,800 | 13,042,500 | 89.0 |
| | | Impula South East, 1985 | 8,500 | 7 | 7 | 22,200 | 9,558,750 | 36.0 |
| | | **Total Angola** | | **426** | **612** | **470,879** | **1,653,486,316** | |
| **ARGENTINA** | YPF | Chubut, 1907 | 1,908-9,168 | 2,357 | 2,429 | 84,510 | 4,855,710,000 | 21.1-26.0 |
| | | Formosa, 1984 | 11,466-11,490 | 13 | 14 | 9,483 | | 42.0-42.9 |
| | | Jujuy, 1969 | 2,461-16,732 | 10 | 10 | 735 | | 46.5-47.0 |
| | | La Pampa, 1968 | 3,609-4,921 | 223 | 230 | 9,137 | | 31.0 |
| | | Mendoza, 1932 | 2,178-16,778 | 1,056 | 1,092 | 10,756 | | 23.7-32.0 |
| | | Neuquen, 1918 | 1,312-12,496 | 1,265 | 1,348 | 105,906 | | 24.0-41.0 |
| | | Rio Negro, 1960 | 2,953-7,546 | 981 | 1,002 | 7,059 | | 22.5-41.0 |
| | | Salta, 1928 | 6,551-15,092 | 34 | 48 | 6,770 | | 29.0-59.0 |
| | | Santa Cruz, 1946 | 1,466-17,060 | 3,051 | 3,149 | 93,846 | | 21.1-30.0 |
| | | Tierra del Fuego, 1959 | 5,249-7,824 | 215 | 220 | 44,048 | | 43.4-46.0 |
| | AMOCO | Cerro Dragon, 1958 | 7,200 | 1,100 | 1,600 | 41,058 | 454,455,459 | 21.0 |
| | OTHER OPERATORS[e] | All fields | ... | ... | ... | 68,000 | 24,820,000 | ... |
| | | **Total Argentina** | | **10,305** | **11,142** | **481,309** | **5,334,985,459** | |
| **AUSTRALIA** | BARRACK ENERGY | Mount Homer, 1965 | 3,900-5,800 | 7 | 8 | 605 | 440,248 | 38.0 |
| | BHP PETROLEUM PTY. LTD | • Challis/Cassini, 1984 | 5,000 | 7 | 7 | 30,300 | 11,600,000 | 39.5 |
| | | • Jabiru, 1983 | 4,786 | 4 | 4 | 53,300 | 55,600,000 | 42.3 |
| | HADSON ENERGY LTD. | • Harriet, 1983 | 6,230 | 12 | 12 | 11,900 | 19,260,000 | 38.2 |
| | AGL PETROLEUM | Alton, 1964 | 6,000 | 3 | 8 | 28 | 1,919,391 | 49.5 |
| | | Anabranch, 1965 | 4,188 | ... | ... | ... | 13,718 | 44.0 |
| | | Bennett, 1965 | 5,960 | 1 | 1 | 5 | 120,268 | 45.0 |
| | | Cabawin, 1961 | 10,800 | 1 | 1 | 2 | 62,966 | 49.0 |
| | | Maffra, 1965 | 4,251 | 1 | 1 | 13 | 42,945 | 48.0 |
| | | Mereenie, 1964 | 4,000 | 24 | 37 | 1,500 | 5,152,475 | 48.9 |
| | | Merit, #1, 1985 | 4,521 | 1 | 1 | 66 | 74,358 | 51.0 |
| | | Moonie, 1961 | 5,800 | 19 | 38 | 500 | 22,286,028 | 44.5 |
| | | Richmond, 1963 | 3,643 | 1 | 1 | ... | 16,388 | 43.0 |
| | | Snake Creek, 1964 | 4,990 | ... | ... | ... | 13,158 | 67.0 |
| | | Sunny Bank, 1962 | 6,139 | ... | ... | ... | 706 | 40.0 |
| | | Trinidad 1 & 3, 1965 | 4,599 | 1 | 1 | ... | 63,594 | 46.0 |
| | EROMANGA ENERGY | Blina, 1981 | 4,300 | 5 | 6 | 222 | 1,345,650 | 38.0 |
| | | Boundary, 1990 | 3,940 | 1 | 1 | 44 | 220 | 31.0 |
| | | Lloyd, 1987 | 4,806 | 1 | 1 | 44 | 144,340 | 37.0 |
| | | Sundown, 1983 | 3,600 | 2 | 4 | 14 | 196,560 | 39.0 |
| | | West Terrace, 1985 | 3,800 | 2 | 2 | 30 | 146,920 | 33.0 |
| | WOODSIDE | • North Rankin,[c] 1972 | 9,800 | 20 | 20 | 30,000 | 37,000,000 | 53.1 |
| | COMMAND | Dilkera, 1969 | 3,447 | 1 | 1 | 17 | 5,747 | 46.0 |
| | | Fairymount, 1985 | 6,730 | 5 | 6 | 409 | 617,003 | 50.5 |

WORLDWIDE PRODUCTION

| | Name of field, discovery date | Depth, ft | No. of wells<br>Producing | Total | Production<br>1990 average b/d | Cumulative to Dec. 31, 1990 bbl | °API gravity |
|---|---|---|---|---|---|---|---|
| | Kihee, 1986 | 3,200 | ... | 1 | ... | 813 | 44.7 |
| | Koora, 1985 | 4,822 | ... | 1 | ... | 952 | 41.0 |
| | Maxwell South, 1989 | 2,822 | 1 | 1 | 62 | 19,650 | 47.2 |
| | Maxwell, 1987 | 2,930 | 3 | 3 | 245 | 268,960 | 47.2 |
| | Mindagabie, 1987 | 5,290 | ... | 1 | ... | 658 | 40.3 |
| | Muthero, 1989 | 3,448 | 1 | 1 | 76 | 36,304 | 44.4 |
| | Nockatunga, 1983 | 3,310 | 3 | 5 | 104 | 373,142 | 48.0 |
| | Thungo, 1986 | 3,345 | 4 | 4 | 271 | 387,982 | 46.8 |
| | Winna, 1985 | 3,300 | 2 | 2 | 73 | 150,728 | 45.8 |
| **ESSO-BHP** | • Barracouta, 1965 | 4,550 | 7 | 10 | 1,140 | 35,496,000 | 62.8 |
| | • Bream, 1969 | 6,290 | 14 | 24 | 30,190 | 20,260,000 | 44.0 |
| | • Cobia, 1972 | 7,700 | 10 | 12 | 23,010 | 94,456,000 | 44.6 |
| | • Dolphin, 1967 | 4,000 | 1 | 1 | 7,640 | 2,786,000 | 45.0 |
| | • Flounder, 1968 | 8,200 | 19 | 22 | 26,640 | 36,467,000 | 46.7 |
| | • Fortescue, 1978 | 7,700 | 14 | 28 | 42,630 | 206,886,000 | 43.0 |
| | • Halibut, 1967 | 7,700 | 11 | 16 | 30,520 | 733,447,000 | 43.3 |
| | • Kingfish, 1967 | 7,500 | 23 | 30 | 37,330 | 979,933,000 | 46.9 |
| | • Mackerel, 1969 | 7,700 | 14 | 18 | 23,250 | 397,849,000 | 45.6 |
| | • Marlin, 1966 | 5,100 | 16 | 22 | 6,700 | 64,647,000 | 50.0 |
| | • Perch, 1968 | 3,700 | 1 | 1 | 9,150 | 3,341,000 | 41.0 |
| | • Seahorse, 1978 | 4,700 | 1 | 1 | 710 | 280,000 | 53.0 |
| | • Snapper, 1968 | 4,350 | 11 | 27 | 6,600 | 18,681,000 | 47.0 |
| | • Tarwhine, 1981 | 4,500 | 1 | 1 | 3,350 | 1,222,000 | 58.0 |
| | • Tuna, 1968 | 6,500 | 11 | 18 | 10,670 | 41,647,000 | 40.5 |
| | • West Kingfish, 1968 | 7,500 | 16 | 19 | 40,120 | 98,527,000 | 46.9 |
| | • Whiting, 1983 | 4,800 | 4 | 5 | 14,600 | 5,924,000 | 53.0 |
| **MARATHON AUST** | • Talisman, 1984 | 9,600 | 2 | 2 | 4,953 | 4,484,554 | 41.0 |
| **OIL COMPANY OF AUSTRALIA** | Black Stump, 1986 | 3,815 | 1 | 1 | 50 | 169,838 | 45.2 |
| | Bodalla South, 1984 | 4,789-5,215 | 6 | 7 | 746 | 4,063,669 | 47.8 |
| | Bora Creek, 1982 | 4,900 | 1 | 1 | 2 | 18,186 | 34.0 |
| | Cogoon River West, 1990 | 4,680 | ... | 1 | ... | ... | |
| | Kenmore, 1985 | 4,593-4,986 | 9 | 11 | 1,915 | 4,652,099 | 48.2 |
| | Kincora, 1980 | 4,700 | 1 | 1 | 10 | 307,058 | 34.0 |
| | Riverslea, 1981 | 4,950 | 2 | 2 | 55 | 374,206 | 37.0 |
| | Sandy Creek, 1982 | 4,900 | ... | 1. | ... | 8,730 | 34.0 |
| | Waratah, 1982 | 5,350 | 3 | 4 | 40 | 312,503 | 34.0 |
| | Washpool, 1985 | 5,250 | 1 | 1 | 5 | 3,650 | 35.0 |
| **WESTERN MINING CORP.** | • Chervil, 1983 | 3,360 | 2 | 2 | 2,266 | 1,300,595 | 45.0 |
| | • North Herald, 1983 | 3,837 | 1 | 1 | 1,641 | 3,462,228 | 45.0 |
| | • South Pepper, 1983 | 4,036 | 6 | 6 | 5,741 | 5,365,015 | 45.0 |
| **BRIDGE OIL LTD.** | Boggo Creek, 1980 | 5,320 | ... | 1 | ... | 3,000 | 48.0 |
| | Louise, 1986 | 5,910 | 1 | 2 | 32 | 109,686 | 58.0 |
| | Narrows, 1986 | 5,739 | 1 | 1 | 7 | 25,439 | 60.0 |
| | Taylor, 1986 | 5,538 | 11 | 14 | 768 | 785,591 | 47.0 |
| | Thomby Creek, 1979 | 5,170 | ... | 3 | ... | 54,000 | 50.0 |
| | Waggamba, 1978 | 7,670 | 1 | 1 | 12 | 20,962 | 55.0 |
| | Yellowbank Creek, 1982 | 5,180 | 1 | 2 | 23 | 372,817 | 52.0 |
| **AMPOLEX (PPL) PTY. LTD.**[a] | Cranstoun, 1987 | 4,250 | 1 | 1 | | | 48.0 |
| | Endeavour, 1989 | 5,086 | 1 | 1 | | | 49.7 |
| | Ipundu, 1986 | 2,700 | 1 | 1 | | | 43.0 |
| | Ipundu, North, 1989 | 4,354 | 1 | 1 | | | 49.7 |
| | Monler, 1987 | 4,150 | 2 | 2 | | | 49.0 |
| | Talgeberry, 1985 | 3,900 | 2 | 3 | | | 46.0 |
| | Taiyah, 1985 | 3,800 | 1 | 1 | | | 43.0 |
| | Tarbat, 1988 | 2,700 | 1 | 1 | | | 43.0 |
| | Tintaburra, 1984 | 3,500 | 5 | 6 | | | 43.0 |
| | Toobunyah, 1985 | 3,600 | 4 | 5 | | | 43.0 |
| **SANTOS LTD.**[a] | Alwyn, 1985 | 5,200 | 2 | 2 | | | 41.0 |
| | Big Lake, 1984 | 6,600 | 2 | 3 | | | 45.0-48.0 |
| | Bogala, 1984 | 6,800 | 2 | 2 | | | 40.0 |
| | Bookabourdie, 1985 | 7,000 | 2 | 2 | | | 46.0 |
| | Brolga, 1983 | 9,547 | 1 | 1 | | | 53.0 |
| | Challum, 1983 | ... | ... | 1 | | | ... |
| | Chookoo, 1985 | 6,000 | 4 | 8 | | | 45.0 |
| | Cook, 1985 | ... | ... | 1 | | | ... |
| | Corella, 1989 | ... | 1 | 1 | | | ... |
| | Cooroo/Cooroo North, 1986 | ... | 4 | 5 | | | ... |
| | Dingera, 1987 | ... | ... | 1 | | | ... |
| | Dirkala, 1986 | 7,000 | 1 | 1 | | | 56.0 |
| | Dullingari, 1979 | 5,200 | 15 | 31 | | | 54.0 |
| | Fly Lake, 1971 | 9,300 | 1 | 3 | | | 53.0 |
| | Gidgealpa, 1964 | 9,150 | 13 | 13 | | | 45.0-50.0 |
| | Gidgee, 1989 | ... | 1 | 1 | | | ... |
| | Gunna, 1983 | 6,000 | 1 | 1 | | | 40.0 |
| | James, 1989 | ... | 1 | 1 | | | ... |
| | Jackson, 1981 | 4,750 | 35 | 36 | | | 40.0-48.0 |
| | Jackson South, 1982 | 4,800 | 5 | 8 | | | 40.0 |
| | Jena, 1985 | 5,200 | 4 | 4 | | | 41.0 |
| | Kercummurra, 1985 | ... | ... | 1 | | | 50.8 |
| | Keranna, 1984 | 4,300 | ... | 1 | | | 41.0 |

WORLDWIDE PRODUCTION

| | | | | No. of wells | | Production | | |
|---|---|---|---|---|---|---|---|---|
| | | Name of field, discovery date | Depth, ft | Producing | Total | 1990 average b/d | Cumulative to Dec. 31, 1990 bbl | °API gravity |
| | | Limestone Creek/Biala, 1984 | 5,100 | 10 | 11 | 113,574 | 383,271,834 | 41.0 |
| | | Mawson, 1987 | ... | 1 | 1 | | | ... |
| | | McKinlay, 1985 | 5,100 | 1 | 2 | | | 41.0 |
| | | Meranji, 1985 | 5,660 | 3 | 3 | | | 1.0 |
| | | Merrimelia, 1983 | 5,250-7,070 | 10 | 11 | | | 5.5 |
| | | Moolampah, 1985 | 6,000 | 2 | 2 | | | ... |
| | | Moorari, 1971 | 7,705-9,400 | 6 | 6 | | | 6.9 |
| | | Munro, 1988 | ... | 2 | 2 | | | ... |
| | | Muteroo, 1985 | 6,000 | 5 | 5 | | | 5.0 |
| | | Naccowlah, 1989 | ... | 1 | 1 | | | ... |
| | | Naccowlah East, 1988 | ... | 1 | 1 | | | ... |
| | | Naccowlah South, 1983 | 6,000 | 9 | 10 | | | ... |
| | | Naccowlah West, 1983 | 5,700 | 9 | 9 | | | ... |
| | | Narcoonowie, 1983 | 6,000 | 2 | 2 | | | ... |
| | | Natan | ... | 1 | 1 | | | ... |
| | | Nungeroo, 1985 | 4,150 | 1 | 1 | | | ... |
| | | Pinaroo, 1889 | ... | 1 | 1 | | | ... |
| | | Pintari North, 1988 | ... | 1 | 1 | | | ... |
| | | Pitchery, 1988 | ... | 1 | 1 | | | ... |
| | | Sigma, 1983 | 5,700 | 2 | 2 | | | ... |
| | | Spencer, 1986 | 6,500 | 6 | 6 | | | 7.0 |
| | | Strzelecki, 1978 | 5,800 | 15 | 17 | | | ... |
| | | Sturt, 1988 | ... | 4 | 4 | | | ... |
| | | Sturt East | ... | 4 | 4 | | | ... |
| | | Taloola, 1988 | ... | 2 | 2 | | | ... |
| | | Tantanna, 1986 | ... | 4 | 4 | | | ... |
| | | Tickalara, 1984 | 5,600 | 5 | 5 | | | ... |
| | | Tinpilla, 1983 | 6,000 | 1 | 1 | | | ... |
| | | Tirrawarra, 1970 | 9,500 | 29 | 40 | | | 2.0 |
| | | Toby, 1987 | ... | ... | 1 | | | ... |
| | | Ulandi, 1985 | 5,200 | 3 | 3 | | | 0.4 |
| | | Wandilo, 1989 | ... | 2 | 2 | | | ... |
| | | Wancoocha, 1984 | 6,000 | 3 | 6 | | | 54.0 |
| | | Watson, 1985 | ... | 2 | 2 | | | ... |
| | | Watson South, 1985 | 5,500 | 2 | 2 | | | 40.0 |
| | | Wilson, 1983 | 5,000 | 5 | 6 | | | ... |
| | | Woolkina, 1982 | 9,700 | 1 | 2 | | | ... |
| | | Yanda, 1984 | 8,000 | 1 | 1 | | | ... |
| | WAPET GROUP[e] | Barrow Island, 1964 | 1,200-6,700 | 412 | 539 | | | 37.7 |
| | | Dongara, 1969 | 5,250-5,577 | 1 | 9 | | | 35.5 |
| | | Thevenard Island, 1985 | 4,600-5,750 | 7 | 7 | | | 48.2 |
| | STRATA OIL[e] | Woodada,[c] 1980 | 7,400 | ... | ... | | | 54.0 |
| | | **Total Australia** | | **1,050** | **1,386** | **570,000** | **3,308,380,552** | |
| **AUSTRIA** | MOBIL/SHELL | Gaiselberg, 1938 | 5,200 | 33 | 63 | 676 | 32,898,048 | 25.0 |
| | | Kemating, 1979 | 6,100 | 7 | 9 | 578 | 4,459,284 | 34.0 |
| | | Sattledt, 1971 | 5,700 | 11 | 19 | 528 | 5,642,300 | 37.0 |
| | | Other | ... | 55 | 153 | 1,376 | 47,429,636 | 33.0 |
| | OEMV | Hochleiten, 1977 | 3,100-5,000 | 29 | 45 | 1,012 | 2,245,614 | 21.3 |
| | | Matzen, 1949 | 6,100 | 736 | 904 | 10,754 | 393,242,308 | 25.7 |
| | | Muehlberg, 1942 | 3,900-5,500 | 36 | 46 | 262 | 40,722,889 | 35.0 |
| | | Piperbach, 1968 | 3,500 | 7 | 8 | 162 | 4,106,580 | 39.0 |
| | | Pirawarth, 1957 | 1,600-6,500 | 56 | 65 | 1,059 | 13,367,250 | 28.4 |
| | | Schoenkirchen-Protles Tief, 1962 | 7,800-10,100 | 14 | 20 | 3,577 | 61,238,735 | 31.1 |
| | | St. Ulrich, 1938 | 1,600-4,300 | 85 | 167 | 691 | 43,614,185 | 31.1 |
| | | **Total Austria** | | **1,242** | **1,651** | **21,722** | **697,291,585** | |
| **BAHRAIN** | BANOCO | Awali, 1932 | 1,650-4,600 | 317 | 368 | 38,276 | 827,570,740 | 33.0 |
| | | **Total Bahrain** | | **317** | **368** | **38,276** | **827,570,740** | **33.0** |
| **BARBADOS** | BARB. NOC | Woodbourne, 1966 | 1,665-6,701 | 93 | 156 | 1,245 | 5,861,102 | 27.2 |
| | | **Total Barbados** | | **93** | **156** | **1,245** | **5,861,102** | **27.2** |
| **BENIN** | PROJET PÉTROLIER DE SÈMÉ | Seme, 1968 | 6,232 | 8 | 9 | 3,879 | 15,184,085 | 22.6 |
| | | **Total Benin** | | **8** | **9** | **3,879** | **15,184,085** | |
| **BOLIVIA** | YPFB | Caigua, 1973 | 3,280 | ... | ... | ... | 6,194,981 | 45.0 |
| | | Cambeiti, 1976 | 5,787 | 6 | 6 | 97 | 1,038,816 | 48.0 |
| | | Camiri, 1927 | 3,936 | 42 | 50 | 332 | 48,708,260 | 56.0 |
| | | Caranda, 1960 | 13,032 | ... | ... | ... | 54,389,920 | 60.0 |
| | | Cascabel, 1985 | 11,319 | 2 | 2 | 369 | 384,103 | 45.6 |
| | | Colpa, 1962 | 9,184 | ... | ... | ... | 18,284,329 | 65.0 |
| | | Espino, 1979 | 14,655 | ... | ... | ... | 996,307 | 56.2 |
| | | H. Suarez R., 1962 | 7,820 | 3 | 3 | 375 | 623,436 | 35.0 |
| | | La Pena, 1965 | 8,856 | 30 | 41 | 4,346 | 30,205,438 | 43.0 |
| | | Monteagudo, 1967 | 4,502 | 22 | 24 | 1,086 | 32,977,717 | 41.0 |

| | | Name of field, discovery date | Depth, ft | No. of wells | | Production | | °API gravity |
|---|---|---|---|---|---|---|---|---|
| | | | | Producing | Total | 1980 average b/d | Cumulative to Dec. 31, 1980 bbl | |
| | | Naranjillos, 1964 | 4,806 | 14 | 14 | 112 | 133,505 | 65.3 |
| | | Palmar, 1964 | 10,758 | 2 | 4 | 71 | 1,772,143 | 65.0 |
| | | Rio Grande, 1962 | 9,512 | 35 | 44 | 1,628 | 62,053,852 | 62.0 |
| | | San Roque, 1981 | 7,170 | 13 | 14 | 2,651 | 2,317,666 | 71.0 |
| | | Santa Cruz, 1965 | 9,350 | 8 | 9 | 340 | 1,863,301 | 65.0 |
| | | Sirari, 1985 | 13,999 | 5 | 5 | 943 | 657,814 | 65.3 |
| | | Tatarenda, 1964 | 2,296 | 9 | 12 | 159 | 7,513,246 | 51.0 |
| | | Tita, 1976 | 6,450 | 5 | 5 | 77 | 4,436,605 | 67.9 |
| | | Vibora, 1988 | 12,949 | 5 | 5 | 880 | 649,632 | 57.7 |
| | | Villamontes, 1967 | 9,770 | 2 | 3 | 212 | 632,212 | 57.0 |
| | | Vuelta Grande, 1978 | 8,220 | 18 | 18 | 2,729 | 4,269,758 | 67.0 |
| | | Other | ... | 26 | 36 | 605 | 16,772,221 | ... |
| | **PLUS PETROL** | Bermejo, 1924 | 2,085 | 15 | 30 | 6 | 2,260 | 42.0 |
| | **SOL PETROL** | Buena Vista, 1956 | 4,881 | 1 | 1 | 25 | 12,347 | 45.8 |
| | | Camatindi, 1929 | 4,110 | 3 | 3 | 101 | 43,684 | 42.4 |
| | | Caigua, 1973 | 3,280 | 1 | 1 | 1 | 296 | 42.4 |
| | **PEREZ** | Caranda, 1960 | 13,032 | 37 | 45 | 346 | 126,387 | 60.0 |
| | | Colpa, 1962 | 9,184 | 18 | 19 | 316 | 114,786 | 65.0 |
| | **OCCIDENTAL** | Porvenir, 1978 | 9,600 | 10 | 10 | 1,565 | 12,553,382 | 60.5 |
| | **TESORO BOLIVIA PETROLEUM CO.** | Escondido, 1980 | 11,293 | 5 | 6 | 16 | 5,922 | 60.0 |
| | | La Vertiente, 1977 | 15,230 | 6 | 7 | 920 | 5,145,532 | 50.0 |
| | | Los Suris, 1981 | 13,577 | 1 | 1 | ... | ... | 50.0 |
| | | Taiguati, 1981 | 10,174 | 2 | 2 | 625 | 317,770 | 63.0 |
| | | **Total Bolivia** | | **343** | **418** | **20,918** | **315,075,807** | |
| **BRAZIL**(e) | **ALAGOAS** | Furado, 1969 | 4,440-5,500 | 51 | 68 | | | 35.0 |
| | | • Mero, 1974 | 6,500-7,400 | ... | ... | | | 36.0 |
| | | Pilar, 1981 | 4,100-5,100 | 56 | 62 | | | 40.0 |
| | | Tabuleiro de Martins, 1957 | 3,900-4,950 | 28 | 29 | | | 27.0 |
| | | Other | ... | 18 | 27 | | | ... |
| | **AMAZONAS** | Igarape Cuia, 1985 | 3,600-3,700 | ... | ... | | | 41.0 |
| | | Rio Urucú, 1986 | 7,500-8,300 | 13 | 13 | | | 44.0 |
| | **BAHIA** | Agua Grande, 1951 | 820-4,265 | 113 | 124 | | | 40.0 |
| | | Aracas, 1965 | 3,280-8,856 | 149 | 181 | | | 41.0 |
| | | Buracica, 1959 | 1,476-1,840 | 171 | 190 | | | 35.0 |
| | | Candeias, 1941 | 3,280-7,415 | 36 | 39 | | | 30.0 |
| | | • Candeias Mar, 1941 | 3,300-7,400 | 17 | 17 | | | 30.0 |
| | | Cassarongongo, 1959 | 1,475-4,755 | 153 | 159 | | | 32.0 |
| | | Cexis, 1963 | 1,670-5,230 | 34 | 34 | | | 30.0 |
| | | • Dom Joao Mar, 1947 | 920-3,000 | 219 | 289 | | | 38.0 |
| | | Dom Joao Terra, 1947 | 920-1,350 | 57 | 94 | | | 38.0 |
| | | Faz. Alvorada, 1963 | 2,100-4,900 | 80 | 80 | | | 31.0 |
| | | Faz. Balsamo, 1983 | 2,500-4,000 | 114 | 118 | | | 31.0 |
| | | Faz. Boa Esperanca, 1966 | 7,215-8,036 | 21 | 23 | | | 39.0 |
| | | Faz. Imbe, 1964 | 2,130-5,575 | 59 | 78 | | | 40.0 |
| | | Faz. Panelas, 1962 | 2,400-5,100 | 14 | 27 | | | 37.0 |
| | | • Ilheus, 1979 | 1,500 | ... | ... | | | 41.0 |
| | | Malombe, 1966 | 3,280 | 9 | 15 | | | 41.0 |
| | | Mata/Ramanso, 1971 | 4,445-4,560 | 63 | 76 | | | 35.0 |
| | | Miranga, 1965 | 3,280-3,936 | 227 | 322 | | | 40.0 |
| | | Riacho da Barra, 1982 | 2,910-3,998 | 51 | 63 | | | 39.0 |
| | | Rio Dos Ovos, 1979 | 2,410-3,750 | 10 | 10 | | | 35.0 |
| | | Rio Pojuca, 1982 | 5,600-6,200 | 29 | 42 | | | 35.0 |
| | | Rio do Bú, 1984 | 2,900-3,000 | 50 | 50 | | | 33.0 |
| | | Santana, 1962 | 2,400-4,000 | 5 | 6 | | | 37.0 |
| | | Sesmaria, 1963 | 3,100-4,600 | 26 | 26 | | | 40.0 |
| | | Taquipe, 1958 | 3,115-3,935 | 109 | 138 | | | 40.0 |
| | | Other | ... | 150 | 239 | | | ... |
| | **CEARÁ** | • Atum, 1983 | 5,800-6,750 | 20 | 22 | | | 25.0 |
| | | • Curima, 1978 | 6,888 | 15 | 17 | | | 32.0 |
| | | • Espada, 1983 | 5,750-6,900 | 6 | 6 | | | 26.0 |
| | | Faz. Belem, 1980 | 1,150-2,500 | 281 | 567 | | | 13.0 |
| | | • Xareu, 1977 | 5,717-5,766 | 25 | 27 | | | 30.0 |
| | **ESPIRITO SANTO** | • Cacao, 1978 | 9,184 | 7 | 12 | | | 32.0 |
| | | Faz. Cedro, 1962 | 5,248 | 11 | 14 | | | 28.0 |
| | | Lagoa Parda, 1977 | 5,576 | 49 | 50 | | | 30.0 |
| | | Lagoa Piabanha, 1984 | 6,500 | 2 | 2 | | | 27.0 |
| | | Lagoa Suruaca, 1982 | 6,400 | 22 | 26 | | | 30.0 |
| | | Rio Itaunas, 1977 | 5,400 | 40 | 40 | | | 28.0 |
| | | Rio Preto/Oeste/Sul, 1976 | ... | 37 | 37 | | | ... |
| | | Sao Mateus, 1969 | 5,750 | 45 | 53 | | | 27.0 |
| | | Other | ... | 125 | 125 | | | ... |
| | **RIO DE JANEIRO** | • Albacora, 1984 | 8,430 | 7 | 12 | | | 26.0 |
| | | • Anequim, 1981 | 8,200-8,500 | 2 | 2 | | | 27.0 |
| | | • Area RJS-150, 1983 | 7,300 | ... | ... | | | 26.0 |
| | | • Area RJS-236 Trilha, 1983 | 8,800-11,000 | 3 | 3 | | | 28.0 |
| | | • Area RJS-387, 1987 | 11,300 | 3 | 3 | 633,000 | 2,887,080,940 | 34.0 |
| | | • Badejo, 1981 | 8,900-10,500 | 5 | 6 | | | 28.0 |

| | | Name of field, discovery date | Depth, ft | No. of wells | | Production | | °API gravity |
|---|---|---|---|---|---|---|---|---|
| | | | | Producing | Total | 1980 average b/d | Cumulative to Dec. 31, 1980 bbl | |
| | | • Bagre, 1983 | 8,700-9,000 | 7 | 9 | | | 25.0 |
| | | • Bicudo, 1982 | 8,000-11,000 | 11 | 13 | | | 22.0 |
| | | • Bonito, 1977 | 6,950-8,000 | 11 | 17 | | | 27.0 |
| | | • Carapeba, 1982 | 10,100 | 29 | 36 | | | 23.0 |
| | | • Cherne, 1982 | 9,800-10,200 | 29 | 41 | | | 27.0 |
| | | • Corvina, 1983 | 9,000-11,000 | 5 | 8 | | | 25.0 |
| | | • Enchova, 1976 | 6,973-7,865 | 4 | 24 | | | 23.0 |
| | | • Garoupa, 1974 | 11,382 | 19 | 20 | | | 30.0 |
| | | • Garoupinha, 1974 | 12,693 | 3 | 3 | | | 30.0 |
| | | • Linguado, 1981 | 9,000-11,000 | 11 | 16 | | | 20.0 |
| | | • Marimba, 1983 | 8,900-9,200 | 5 | 5 | | | 26.0 |
| | | • Moreia, 1984 | 8,200-9,500 | 5 | 6 | | | 22.0 |
| | | • Namorado, 1975 | 10,063 | 27 | 45 | | | 28.0 |
| | | • Pampo, 1977 | 6,215 | 24 | 31 | | | 21.0 |
| | | • Parati, 1982 | 8,900-9,200 | 1 | 1 | | | 35.0 |
| | | • Pargo, 1975 | 11,840 | 16 | 21 | | | 20.0 |
| | | • Pirauna, 1982 | 8,000-10,500 | 7 | 8 | | | 27.0 |
| | | • Sul de Pampo, 1978 | 9,300-9,600 | ... | ... | | | 20.0 |
| | | • Vermelho, 1983 | 11,200 | 45 | 62 | | | 24.0 |
| | | • Viola, 1981 | 9,200-9,900 | 8 | 8 | | | 13.0 |
| | RIO GRANDE DO NORTE | • Aguiha, 1975 | 5,412 | 5 | 6 | | | 33.0 |
| | | Alto do Rodrigues, 1981 | 990-1,129 | 290 | 292 | | | 18.0 |
| | | • Area 1-RNS-36, 1982 | ... | ... | ... | | | 32.0 |
| | | Canto do Amaro, 1986 | 2,500-3,600 | 470 | 486 | | | 25.0 |
| | | Estreito/Rio Panon, 1983 | 650- 820 | 447 | 447 | | | 16.0 |
| | | Faz. Pocinho, 1982 | 1,450-2,000 | 174 | 174 | | | 35.0 |
| | | Guamaré, 1983 | 1,400-1,600 | 30 | 33 | | | 25.0 |
| | | Livramento, 1986 | 2,500-3,300 | 30 | 30 | | | 41.0 |
| | | Lorena, 1984 | 1,200-1,700 | 12 | 12 | | | 28.0 |
| | | • Macau-Mar, 1986 | 3,000 | 5 | 5 | | | 31.0 |
| | | Macau/Terra, 1982 | 3,000-3,300 | 2 | 2 | | | 31.0 |
| | | Palmeiras, 1982 | 1,450-1,800 | ... | ... | | | 25.0 |
| | | Serraria, 1982 | 3,200-3,900 | 38 | 38 | | | 27.0 |
| | | • Ubarana, 1973 | 7,216-8,365 | 77 | 92 | | | 40.0 |
| | | Upanema, 1985 | 1,110-1,800 | 15 | 18 | | | 28.0 |
| | | Other | ... | 118 | 119 | | | ... |
| | PARÁ | • Area 1-PAS-11, 1983 | ... | ... | ... | | | 41.0 |
| | MARANHÃO | São João, 1983 | 4,950-6,200 | ... | ... | | | 40.0 |
| | SERGIPE | Atalaia Sul, 1961 | 1,450 | 2 | 3 | | | 24.0 |
| | | Brejo Grande, 1967 | 1,670 | 12 | 12 | | | 26.0 |
| | | • Caioba, 1969 | 6,232-6,890 | 10 | 14 | | | 36.0 |
| | | • Camurim, 1970 | 6,232 | 61 | 62 | | | 25.0 |
| | | Carmopolis, 1963 | 2,460 | 852 | 1,006 | | | 24.0 |
| | | • Dourado, 1970 | 3,620-3,635 | 4 | 4 | | | 36.0 |
| | | • Guaricema, 1968 | 3,335-4,430 | 13 | 16 | | | 41.0 |
| | | Riachuelo, 1961 | 1,475 | 235 | 318 | | | 28.0 |
| | | • Robalo, 1973 | 3,300-4,500 | ... | ... | | | 30.0 |
| | | Siririzinho, 1967 | 1,640 | 177 | 260 | | | 30.0 |
| | | Other | ... | 84 | 85 | | | ... |
| | | **Total Brazil** | | **6,267** | **7,574** | **633,000** | **2,867,899,940** | |
| **BRUNEI** | SHELL | • Ampa SW, 1963 | 7,068-8,156 | 105 | 222 | 52,087 | 562,000,000 | 41.0 |
| | | • Champion, 1970 | 4,300 | 136 | 245 | 37,092 | 327,000,000 | 23.0 |
| | | • Fairley, 1969 | 10,740 | 41 | 54 | 11,844 | 119,500,000 | 40.0 |
| | | • Fairley-Baram, 1973 | 9,500 | 4 | 5 | — | 12,400,000 | 40.0 |
| | | • Magpie, 1975 | ... | 13 | 23 | 15,643 | 85,000,000 | 31.0 |
| | | Rasau, 1929 | ... | 8 | 20 | 2,176 | 6,200,000 | 30.0 |
| | | Seria-Total, 1929 | ... | 275 | 562 | 15,423 | 994,000,000 | 34.0 |
| | | **Total Brunei** | | **584** | **1,131** | **134,265** | **2,106,100,000** | |
| **CAMEROON(•)** | ELF | • Betika, 1972 | 5,300 | 175 | 179 | 161,000 | 560,269,900 | 42.5 |
| | | • Ekoundou S., 1975 | 6,200 | | | | | 24.0 |
| | | • Kole, 1974 | 5,500 | | | | | 31.0 |
| | | • Kombo Center, 1976 | 5,900 | | | | | 37.0 |
| | | • Kombo North, 1976 | 7,200 | | | | | 35.0 |
| | | • Ekoundou Horst plus Center, 1972 | 7,200 | | | | | 29.0 |
| | | • Boa, 1976 | 5,900 | | | | | 35.0 |
| | | • Bavo South, 1976 | 5,600 | | | | | 29.3 |
| | | • Betika S. Marine, 1979 | 6,300 | | | | | 30.0 |
| | | • Ekuondou N. Marine, 1977 | 5,250 | | | | | 36.0 |
| | | • Mokoko NE plus Abana, 1977 | 4,600 | | | | | 29.0 |
| | | • Asoma Marine, 1973 | 3,600 | | | | | 19.0 |
| | | • Kita E. Marine, 1978 | 6,900 | | | | | 40.8 |
| | | • Mokoko S. Marine, 1977 | 3,300 | | | | | 17.0 |
| | | • Inova Marine, 1976 | 6,200 | | | | | 32.8 |
| | TOTAL-CFP | • Moudi, 1979 | 5,250-5,900 | | | | | 40.0 |
| | | • Moudi D., 1980 | 3,300 | | | | | 21.3 |
| | | **Total Cameroon** | | **175** | **179** | **161,000** | **560,269,900** | |

## PRODUCTION

WORLDWIDE PRODUCTION

| | | Name of field, discovery date | Depth, ft | No. of wells Producing | No. of wells Total | Production 1980 average b/d | Production Cumulative to Dec. 31, 1980 bbl | °API gravity |
|---|---|---|---|---|---|---|---|---|
| **CANADA** | ALBERTA | Pembina, 1953 | 3,000-6,133 | 3,363 | 4,278 | 90,310 | 1,310,782,067 | 32.0-37.0 |
| | | Redwater, 1956 | 2,012-3,200 | 566 | 883 | 11,339 | 798,234,221 | 35.0 |
| | | Swan Hills, 1957 | 8,100 | 526 | 836 | 36,748 | 708,688,748 | 40.0 |
| | | Rainbow, 1965 | 4,994-6,160 | 272 | 379 | 37,761 | 543,104,399 | 38.0-42.0 |
| | | Bonnie Glen, 1952 | 3,959-6,779 | 115 | 167 | 8,251 | 510,178,088 | 34.0-44.0 |
| | | Judy Creek, 1951 | 8,307-8,701 | 169 | 268 | 18,342 | 409,254,295 | 43.0 |
| | | Leduc-Woodbend, 1947 | 3,062-5,380 | 137 | 697 | 2,467 | 379,051,864 | 40.0 |
| | | Swan Hills S., 1959 | 8,400 | 163 | 201 | 11,504 | 353,776,546 | ... |
| | | Wizard Lake, 1951 | 4,044-5,973 | 43 | 47 | 7,048 | 328,425,732 | ... |
| | | Fenn-Big Valley, 1950 | 3,900-5,400 | 109 | 236 | 3,891 | 319,092,568 | 32.0 |
| | | Mitsue, 1964 | 5,908 | 291 | 413 | 31,90[illegible] | 305,507,520 | 43.0 |
| | | Nipisi, 1965 | 5,648-5,726 | 264 | 365 | 29,070 | 295,332,578 | 41.0 |
| | | Golden Spike, 1949 | 3,570-5,961 | 64 | 85 | 2,033 | 183,242,716 | 36.0 |
| | | Virginia Hills, 1957 | 9,210 | 149 | 196 | 17,350 | 159,981,121 | 34.0 |
| | | Sturgeon Lake S., 1953 | 4,912-8,471 | 86 | 146 | 12,811 | 152,306,337 | ... |
| | | Carson Creek N., 1958 | 8,787-8,936 | 36 | 62 | 7,006 | 145,868,731 | 44.0 |
| | | Turner Valley, 1913 | 3,100-9,150 | 114 | 156 | 2,596 | 141,816,752 | 39.0 |
| | | Westerose, 1952 | 6,818 | 31 | 44 | 7,260 | 136,625,134 | ... |
| | | Acheson, 1950 | 3,390 | 55 | 116 | 5,440 | 134,165,880 | 38.0 |
| | | Willisden Green, 1956 | 5,157 | 502 | 827 | 7,249 | 122,878,986 | ... |
| | | Provost, 1946 | 2,760-2,898 | 1,759 | 2,243 | 48,932 | 112,742,433 | ... |
| | | Kaybob, 1957 | 4,870-9,577 | 66 | 97 | 7,358 | 107,314,832 | ... |
| | | Grand Forks | ... | 396 | 498 | 23,596 | 106,930,336 | ... |
| | | Joarcam, 1949 | 3,179 | 176 | 272 | 6,439 | 106,824,297 | ... |
| | | Joffre, 1953 | 4,933-6,779 | 97 | 186 | 3,547 | 85,934,655 | ... |
| | | Kaybob S., 1958 | 5,800-10,042 | 70 | 98 | 7,730 | 85,195,161 | ... |
| | | Zama, 1966 | 3,702 | 114 | 236 | 6,033 | 80,228,356 | 33.0-37.0 |
| | | Medicine River, 1954 | 5,435-7,600 | 243 | 369 | 9,777 | 78,654,937 | ... |
| | | Innisfail, 1956 | 8,730-8,440 | 30 | 69 | 3,729 | 78,043,471 | ... |
| | | Harmattan East, 1954 | 6,358-8,766 | 108 | 146 | 4,054 | 75,617,721 | ... |
| | | Wainwright, 1925 | 1,903-2,200 | 608 | 752 | 8,909 | 75,610,522 | ... |
| | | Bellshill Lake, 1955 | 2,950 | 413 | 460 | 10,451 | 71,308,502 | ... |
| | | Rainbow South, 1965 | 6,102-6,400 | 47 | 80 | 5,775 | 68,549,575 | ... |
| | | Countess, 1951 | 2,858-4,272 | 147 | 192 | 6,399 | 68,389,283 | ... |
| | | Harmattan Elkton, 1955 | 8,796-10,757 | 61 | 83 | 4,365 | 65,094,248 | ... |
| | | Bentry, 1940 | 2,574-3,300 | 189 | 239 | 10,571 | 56,600,025 | ... |
| | | Snipe Lake, 1962 | 8,500 | 36 | 92 | 3,230 | 56,466,755 | ... |
| | | Utikuma Lake, 1963 | 5,624 | 113 | 138 | 11,072 | 56,281,474 | ... |
| | | Clive, 1951 | 6,074-6,208 | 126 | 193 | 4,844 | 54,714,329 | ... |
| | | Lloydminster, 1933 | 1,690-1,946 | 104 | 114 | 5,015 | 53,055,037 | ... |
| | | Gilby, 1962 | 4,201-7,000 | 69 | 156 | 2,939 | 49,583,664 | ... |
| | | Caroline | ... | 196 | 291 | 6,968 | 43,354,786 | ... |
| | | Red Earth | 4,164-4,878 | 187 | 289 | 4,631 | 41,420,766 | ... |
| | | Simonette, 1958 | 10,500 | 32 | 48 | 2,151 | 36,767,982 | ... |
| | | Westpem | ... | 11 | 13 | 12,816 | 35,371,839 | ... |
| | | Cessford, 1950 | 2,800-3,028 | 186 | 303 | 2,582 | 32,954,628 | ... |
| | | Taber N., 1966 | 3,110-3,270 | 87 | 129 | 6,257 | 19,257,303 | ... |
| | | Hayter, 1968 | 2,030-2,615 | 313 | 428 | 7,466 | 18,097,042 | ... |
| | | Valhalla, 1973 | 1,815-7,060 | 253 | 306 | 8,562 | 16,845,669 | ... |
| | | Other | ... | 8,882 | 14,022 | 318,973 | 1,711,303,423 | ... |
| | BRITISH COLUMBIA | Boundary Lake, 1957 | 3,418-4,575 | 277 | 368 | 9,055 | 178,555,258 | 40.0 |
| | | Eagle West, 1976 | 2,170-3,940 | 50 | 95 | 4,898 | 30,986,860 | ... |
| | | Other | ... | 377 | 825 | 19,252 | 247,370,990 | ... |
| | MANITOBA | All fields | ... | 1,363 | 1,581 | 12,720 | 175,313,763 | ... |
| | SASKATCHEWAN | Weyburn, 1955 | 4,800 | 821 | 895 | 16,867 | 299,436,322 | ... |
| | | Steelman, 1950 | ... | 646 | 731 | 7,615 | 261,231,030 | ... |
| | | Other | ... | 12,199 | 16,939 | 185,154 | 1,846,534,988 | ... |
| | ONTARIO | All fields | ... | 1,091 | 1,588 | 4,251 | 65,333,969 | ... |
| | NEW BRUNSWICK | All fields | ... | ... | ... | ... | 805,261 | ... |
| | NORTHWEST TERRITORIES | All fields | ... | 159 | 164 | 31,740 | 68,062,306 | ... |
| | | Total Canada* | | 38,159 | 98,086 | 1,264,127 | 14,184,338,085 | |
| **CHILE** | ENAP | Gaviota Norte, 1980 | 7,000 | 3 | 3 | 336 | 122,308 | 38.0 |
| | ENAP-MAINLAND | Canadon, 1962 | 6,090 | 8 | 62 | 99 | 14,658,419 | 38.4 |
| | | Daniel, 1960 | 5,808 | 11 | 121 | 238 | 34,640,428 | 25.4 |
| | | Daniel Este, 1961 | 5,523 | 8 | 66 | 386 | 28,633,636 | 25.0 |
| | | Delgada Este, 1958 | 7,684 | 11 | 31 | 170 | 4,997,084 | 35.0 |
| | | Dungenes, 1962 | 5,251 | 3 | 19 | 141 | 4,132,300 | 28.6 |
| | | Faro Este, 1959 | 7,381 | 4 | 32 | 132 | 3,410,798 | 35.0 |
| | | Posesion, 1960 | 5,622 | 36 | 76 | 706 | 21,942,849 | 63.6 |
| | | Other | ... | 13 | 118 | 1,746 | 18,243,026 | ... |
| | TIERRA DEL FUEGO | Calafate, 1965 | 6,045 | 14 | 61 | 563 | 26,323,717 | 49.3 |
| | | Catalina, 1956 | 5,756 | 8 | 26 | 223 | 6,896,621 | 38.7 |
| | | Catalina Sur, 1961 | 5,779 | 1 | 43 | 14 | 6,390,056 | 44.0 |
| | | Chanarcillo, 1961 | 7,404 | 2 | 17 | 46 | 7,259,121 | 58.2 |
| | | Cullen, 1954 | 5,730 | 12 | 106 | 319 | 61,349,440 | 41.8 |
| | | Gorrion, 1966 | 6,025 | 6 | 10 | 466 | 1,187,719 | 39.0 |
| | | San Sebastian Norte, 1966 | 6,870 | 2 | 4 | 34 | 180,732 | 37.0 |

*Does not include oil sands production or wells.

| | | Name of field, discovery date | Depth, ft | — No. of wells — Producing | Total | — Production — 1990 average b/d | Cumulative to Dec. 31, 1990 bbl | °API gravity |
|---|---|---|---|---|---|---|---|---|
| | | Sombero, 1951 | 7,126 | 2 | 23 | 4 | 13,110,418 | 40.2 |
| | | Tres Lagos, 1957 | 5,724 | 18 | 84 | 418 | 16,300,532 | 40.1 |
| | | Victoria Sur, 1950 | 7,431 | 3 | 34 | 53 | 7,896,085 | 41.1 |
| | | Other | ... | 37 | 264 | 1,125 | 31,789,380 | ... |
| | STRAIT OF MAGELLAN | Daniel Este-Dungeness, 1977 | 6,126 | 18 | 36 | 1,142 | 5,102,249 | 35.9 |
| | | Jaiba, 1978 | 6,650 | ... | 3 | 34 | 326,576 | 46.5 |
| | | Ostion, 1977 | 7,156 | 12 | 13 | 580 | 6,518,539 | 33.0 |
| | | Pejerrey, 1964 | 7,229 | 19 | 67 | 712 | 10,219,611 | 39.0 |
| | | Posesion, 1977 | 6,727 | 15 | 36 | 489 | 5,734,362 | 34.5 |
| | | Skua, 1968 | 5,932 | 25 | 39 | 3,230 | 4,144,467 | 32.0 |
| | | Spiteful, 1977 | 6,298 | 30 | 62 | 2,307 | 44,376,313 | 34.5 |
| | | Spiteful Norte, 1978 | 7,150 | 10 | 32 | 378 | 9,799,172 | 39.0 |
| | | **Total Chile** | | 331 | 1,511 | 16,042 | 375,486,071 | |
| **CHINA(e)** | CNPC | Daqing, 1959 | ... | 49,700 | 49,700 | 1,115,448 | 15,710,067,000 | ... |
| | | Shengli, 1962 | ... | | | 671,836 | | ... |
| | | Huabei | ... | | | 107,293 | | ... |
| | | Liaohe, 1964 | ... | | | 272,745 | | ... |
| | | Xinjiang | ... | | | 136,373 | | ... |
| | | Dagang, 1964 | ... | | | 76,810 | | ... |
| | | Henan | ... | | | 50,536 | | ... |
| | | Zhongyuan, 1981 | ... | | | 126,345 | | ... |
| | | Jilin, 1978 | ... | | | 71,195 | | ... |
| | | Changqing | ... | | | 29,280 | | ... |
| | | Henjiang | ... | | | 7,621 | | ... |
| | | Yumen | ... | | | 10,830 | | ... |
| | | Jiangsu | ... | | | 17,047 | | ... |
| | | Qinghai | ... | | | 16,044 | | ... |
| | | Sichuan | ... | | | 2,607 | | ... |
| | | Jidong | ... | | | 7,019 | | ... |
| | | • Cnooc | ... | | | 25,269 | | ... |
| | | Other | ... | | | 23,264 | | ... |
| | | **Total China** | | 49,700 | 49,700 | 2,767,564 | 15,710,067,000 | |
| **CHINA, TAIWAN** | CHINESE PETROLEUM | Chingtsohu & CBK(c), 1967 | ... | 7 | 26 | 1,588 | 3,506,165 | 50.0 |
| | | Chinshui & Yunghoshan(c), 1971 | ... | 23 | 36 | 265 | 3,441,228 | 45.0 |
| | | Chuhuangkeng(c), 1904 | ... | 30 | 32 | 162 | 2,839,361 | 50.0 |
| | | Tiechengshan(c), 1962 | ... | 24 | 31 | 779 | 16,112,406 | 51.0 |
| | | Other(c) | ... | 9 | 10 | 5 | 45,213 | |
| | | **Total China, Taiwan** | | 93 | 136 | 2,799 | 25,944,373 | |
| **COLOMBIA** | ARGOSY(a) | Bourdine, 1974 | 11,000 | 2 | 4 | 148,046 | 2,218,546,000 | 26.7 |
| | | Máxime, 1976 | 11,000 | 1 | 1 | | | 11.0 |
| | | Nancy, 1974 | 11,000 | 1 | 1 | | | 26.0 |
| | HOCOL SA (SHELL)(a) | Palogrande, 1971 | 6,500 | 32 | 36 | | | 20.0 |
| | | Pijao, 1981 | 7,000 | 6 | 7 | | | 21.0 |
| | | San Francisco, 1985 | 2,800 | 41 | 41 | | | 27.0 |
| | | Hato Nuevo, 1984 | 6,900 | 2 | 4 | | | 36.0 |
| | | Teney, 1985 | 11,500 | 3 | 3 | | | 36.3 |
| | | Santa Clara, 1987 | 2,100 | 5 | 6 | | | 19.0 |
| | | La Jagua, 1986 | 5,300 | 2 | 2 | | | 22.0 |
| | | Loma Larga, 1985 | 3,500 | 1 | 1 | | | 22.4 |
| | | Brisas, 1973 | 4,200 | 4 | 6 | | | 23.5 |
| | | Dina T, 1962 | 3,600 | 51 | 64 | | | 20.0 |
| | | Dina K, 1969 | 6,500 | 22 | 26 | | | 22.0 |
| | | La Canada, 1988 | 700 | 5 | 7 | | | 22.0 |
| | | Tello, 1972 | 7,500 | 30 | 34 | | | 22.0 |
| | | Cebu, 1981 | 6,500 | 8 | 10 | | | 19.0 |
| | ECOPETROL(a) | Apiay, 1981 | 10,600 | 13 | 15 | | | 23.0 |
| | | Apiay Este, 1987 | 10,300 | 1 | 1 | | | 16.0 |
| | | Boquete, 1962 | 8,100 | 8 | 24 | | | 43.0 |
| | | Caipal/Ermitaño, 1954, 1967 | 3,600 | 3 | 19 | | | 15.0 |
| | | Campo Yuca, 1958 | ... | 1 | 4 | | | 32.0 |
| | | Cantagallo/Yarigui, 1943, 1955 | 6,800-8,700 | 68 | 92 | | | 20.0 |
| | | Carbonera, 1939 | ... | 4 | 8 | | | 32.0 |
| | | Caribe, 1970 | 5,400 | 3 | 4 | | | 31.0 |
| | | Casabe, 1940 | 3,800 | 909 | 1,039 | | | 19.0-22.0 |
| | | Churuyaco/Sucumbios, 1967, 1969 | ... | 6 | 7 | | | 31.0 |
| | | Cicuco, 1946 | 8,600 | 5 | 28 | | | 41.0 |
| | | Colorado, 1925 | ... | 45 | 76 | | | 34.0 |
| | | Galan/San Silvestre, 1943 | 3,200 | 53 | 102 | | | 18.0 |
| | | Garzas, 1957 | ... | 1 | 2 | | | 28.0 |
| | | Guatiquia, 1985 | 10,700 | 2 | 2 | | | 20.0 |
| | | Hormiga, 1962 | 10,300 | 2 | 3 | | | 29.0 |
| | | Infantas, 1918 | 3,200 | 306 | 586 | | | 28.0 |
| | | La Cira, 1918 | 3,250 | 707 | 951 | | | 23.0 |
| | | La Cristalina, 1950 | 10,000 | 1 | 6 | | | 30.0 |
| | | Llanito/Gala/Yuma/Cardales, 1955, 1965, 1966, 1969 | 7,300 | 60 | 87 | | | 18.0-25.0 |

| | | | | No. of wells | | Production | | |
|---|---|---|---|---|---|---|---|---|
| | | Name of field, discovery date | Depth, ft | Producing | Total | 1990 average b/d | Cumulative to Dec. 31, 1990 bbl | °API gravity |
| | | Lisama/Nutria/Tesoro Petroles, 1936, 1966, 1977 | 9,500 | 145 | 219 | | | 28.0-32.0 |
| | | Loro, 19067 | 10,300 | 7 | 12 | | | 30.0 |
| | | Orito, 1948 | 600-5,200 | 51 | 104 | | | 25.0-35.0 |
| | | Ortega, 1951 | 6,500 | 5 | 15 | | | 28.0 |
| | | Palagua, 1954 | 3,500 | 96 | 186 | | | 15.0 |
| | | Peñas Blancas, 1957 | ... | 6 | 7 | | | 23.0 |
| | | Petrolea, 1933 | 1,200 | 5 | 34 | | | 46.0 |
| | | Puerto Barco, 1956 | ... | ... | 4 | | | 50.0-60.0 |
| | | Puerto Colon, 1967 | 9,600 | 7 | 10 | | | 29.0 |
| | | Quilili, 1988 | ... | 2 | 3 | | | 21.0 |
| | | Rio de Oro, 1933 | 1,600-6,500 | 20 | 54 | | | 32.0-43.0 |
| | | San Antonio (S. Miguel), 1967 | 7,820 | 2 | 4 | | | 28.0 |
| | | Sardinata Norte/Sur, 1939, 1942 | 900-4,100 | 14 | 30 | | | 30.0-52.0 |
| | | Sucio, 1971 | 5,500 | 1 | 2 | | | 31.0 |
| | | Suria, 1965 | 10,500 | 7 | 8 | | | 35.0 |
| | | Tibu, 1939 | 4,500-9,300 | 250 | 508 | | | 32.0-45.0 |
| | | Toldado, 1987 | 6,200 | 6 | 7 | | | 20.0 |
| | | Other | ... | 7 | 71 | | | ... |
| | | Aguas Blancas, 1962 | ... | 4 | 7 | | | 20.0 |
| | | Barrancas Lebrija, 1953 | 6,000 | 2 | 11 | | | 25.0 |
| | | Pavas, 1981 | ... | 1 | 1 | | | 21.0 |
| | | San Luis, Totomal, 1927, 1950 | ... | 2 | 7 | | | 24.0-36.0 |
| | | Sogamoso, 1988 | ... | 2 | 4 | | | 29.0 |
| | | Tenerife, 1967 | ... | 1 | 3 | | | 18.0 |
| | ESSO COLOMBIANA LTD. | Arauca, 1980 | 18,000 | 3 | 4 | 1,443 | 6,440,075 | 40.0 |
| | | Bonanza, 1963 | 4,000 | 18 | 18 | 677 | 13,493,912 | 27.0 |
| | | Provincia, 1962 | 8,000 | 134 | 172 | 14,431 | 172,231,467 | 29.0 |
| | | Sabana, 1989 | 14,000 | 3 | 3 | 250 | 198,330 | 29.0 |
| | ELF AQUITAINE | Barquerena, 1982 | 9,300 | 3 | 3 | 886 | 3,650,549 | 33.5 |
| | | Caño Garza, 1979 | 7,900 | 5 | 5 | 4,306 | 3,696,246 | 33.0 |
| | | Caño Garza Norte, 1983 | 7,900 | 2 | 2 | 917 | 2,343,808 | 38.5 |
| | | Cravo Este, 1987 | 11,376 | ... | 1 | ... | 106,833 | 42.0 |
| | | Cravo Sur, 1982 | 10,600 | 2 | 2 | 1,490 | 3,469,581 | 39.0 |
| | | La Gloria, 1990 | 14,000 | 3 | 3 | 1,981 | 723,178 | 17.8 |
| | | Gloria Norte, 1983 | 12,100 | 3 | 3 | 5,078 | 3,458,586 | 18.0 |
| | | Morichal, 1984 | 15,500 | 1 | 1 | 1,586 | 678,332 | 30.0 |
| | | Tierra Blanca, 1987 | 14,403 | 1 | 1 | 738 | 398,967 | 32.0 |
| | | Tocaria, 1980 | 13,500 | 2 | 3 | 1,273 | 1,644,521 | 32.2 |
| | | Trinidad, 1974 | 9,000 | 4 | 4 | 6,182 | 7,347,045 | 33.0 |
| | OCCIDENTAL | Caño Limón, 1984 | 7,600 | 9 | 9 | 28,720 | 52,116,006 | 29.0 |
| | | Cano Yarumal, 1987 | 7,600 | 3 | 4 | 23,516 | 13,213,576 | 29.0 |
| | | La Yuca, 1984 | 7,600 | 34 | 38 | 122,339 | 194,466,422 | 29.4 |
| | | Matanegra, 1984 | 7,600 | 10 | 14 | 24,803 | 47,664,549 | 29.7 |
| | | Redondo, 1984 | 7,600 | 4 | 5 | 8,574 | 9,127,491 | 30.2 |
| | TEXACO | Cocorná, 1963 | 2,100 | 45 | 54 | 1,865 | 15,228,678 | 12.0-13.0 |
| | | Tisquirama, 1963 | 8,000 | 5 | 5 | 404 | 5,126,933 | 16.0-28.0 |
| | | Velasquez, 1946 | 7,500 | 89 | 100 | 2,917 | 168,307,134 | 19.0-24.0 |
| | TEXACO-ECOPETROL | Los Angeles, 1963 | 6,400 | 3 | 4 | 536 | 981,199 | 14.0-15.0 |
| | | Nare, 1981 | 2,100 | 49 | 49 | 3,062 | 2,048,527 | 11.0-12.0 |
| | | Santa Lucia, 1988 | 9,600 | ... | 3 | 28 | 10,150 | 11.7-26.1 |
| | | Teca, 1981 | 2,100 | 226 | 238 | 13,818 | 35,017,883 | 12.0-13.0 |
| | CHEVRON | Castilla, 1969 | 6,500 | 17 | 19 | 13,409 | 34,324,198 | 13.5 |
| | | Chichimene, 1969 | 6,500 | 1 | 2 | 1,112 | 1,176,084 | 21.3 |
| | LASMO | Santiago, 1985 | 9,600 | 5 | 5 | 5,580 | 4,102,981 | 29.0 |
| | | Total Colombia | | 3,740 | 5,387 | 440,000 | 3,021,340,279 | |
| CONGO | AGIP | • Loango, 1972 | 3,000 | 52 | 53 | 18,150 | 103,028,300 | 25.8 |
| | | Zatchi, 1980 | 2,000 | 12 | 12 | 7,150 | 5,457,600 | 24.7 |
| | ELF CONGO | Bindi, 1982 | 4,400 | 1 | 1 | 30 | 153,211 | 34.2 |
| | | • Emeraude, 1969 | 800 | 94 | 101 | 17,400 | 181,916,132 | 22.3 |
| | | Kunji, 1980 | 4,000 | 2 | 2 | 130 | 591,854 | 35.8 |
| | | • Likouala, 1972 | 4,270 | 27 | 41 | 14,400 | 68,348,251 | 32.3 |
| | | Mengo, 1979 | 6,500 | 3 | 3 | 110 | 745,525 | 34.0 |
| | | Pointe Indienne, 1951 | 5,000 | 3 | 5 | 140 | 7,208,572 | 36.9 |
| | | • Sendji, 1973 | 3,940 | 54 | 60 | 6,000 | 75,892,173 | 29.5 |
| | | • Tchibouela, 1980 | 2,110 | 28 | 30 | 55,100 | 46,787,029 | 27.0 |
| | | • Yanga, 1979 | 2,950 | 51 | 69 | 16,500 | 81,335,698 | 29.4 |
| | | Total Congo | | 327 | 397 | 135,110 | 571,464,345 | |
| DENMARK | DUC | • Dan, 1971 | 6,000-6,400 | 41 | 51 | 27,247 | 67,219,243 | 29.5 |
| | | • Gorm, 1971 | 6,500-7,000 | 21 | 28 | 24,803 | 93,111,368 | 33.9 |
| | | • Rolf, 1981 | 5,900 | 1 | 2 | 4,669 | 13,615,011 | 35.3 |
| | | • Skjold, 1977 | 5,000 | 3 | 7 | 45,347 | 65,804,468 | 30.3 |
| | | • Tyra, 1988 | 6,500 | 32 | 40 | 18,612 | 30,924,721 | 50.4 |
| | | Total Denmark | | 98 | 128 | 120,678 | 270,474,831 | |

WORLDWIDE PRODUCTION

| | | Name of field, discovery date | Depth, ft | No. of wells — Producing | No. of wells — Total | Production — 1986 average b/d | Production — Cumulative to Dec. 31, 1986 bbl | °API gravity |
|---|---|---|---|---|---|---|---|---|
| **DUBAI** | DUPETCO[e] | • Fateh, 1966 | 7,900-9,000 | 141 | 156 | 406,000 | 2,317,992,600 | 31.8 |
| | | • S.W. Fateh, 1970 | 7,500-9,000 | | | | | 30.3 |
| | | • Falah, 1972 | 8,100 | | | | | 25.5 |
| | | • Rashid, 1973 | 9,400-11,500 | | | | | 38.0 |
| | ARCO | Margham, 1981 | 9,400-11,200 | 9 | 16 | 15,353 | 40,164,000 | 43.5 |
| | | **Total Dubai** | | 150 | 172 | 421,353 | 2,358,156,600 | |
| **ECUADOR** | TEXACO-PETROECUADOR | Atacapi, 1968 | 9,855 | 3 | 5 | 1,396 | 13,210,632 | 31.0 |
| | | Auca, 1970 | 10,578 | 25 | 25 | 15,375 | 82,356,956 | 28.0 |
| | | Auca Sur, 1980 | 9,100-10,300 | 2 | 2 | 567 | 1,840,547 | 25.6 |
| | | Cononaco, 1972 | 11,233 | 9 | 11 | 12,569 | 35,326,700 | 33.3 |
| | | Culebra, 1973 | 10,626 | 2 | 2 | 1,263 | 3,042,281 | 17.5 |
| | | Dureno/Guanta, 1968 | 9,575-10,290 | 6 | 10 | 6,918 | 11,164,033 | 31.0 |
| | | Lago Agrio, 1967 | 10,175 | 19 | 33 | 8,048 | 117,716,420 | 28.5 |
| | | Parahuacu, 1968 | 10,173 | 3 | 5 | 1,055 | 7,157,600 | 30.0 |
| | | Rumiyacu, 1982 | 10,191 | ... | 1 | ... | 184,939 | 21.0 |
| | | Sacha, 1969 | 10,160 | 97 | 105 | 63,935 | 406,809,396 | 28.0 |
| | | Shushufindi/Aguarico, 1969 | 9,772 | 51 | 70 | 100,067 | 650,772,391 | 30.0 |
| | | Yuca, 1970 | 10,423 | 6 | 7 | 3,642 | 13,685,187 | 28.0 |
| | | Yuca Sur, 1979 | 9,600-10,000 | 1 | 1 | 224 | 1,334,172 | 14.5 |
| | | Yulebra, 1980 | 8,800-10,000 | 3 | 3 | 1,866 | 4,275,599 | 21.4 |
| | CICL[e] | Fanny, 1972 | 7,700 | 8 | 8 | 69,065 | 262,848,047 | 22.5 |
| | | Mariann, 1971 | 7,700 | 5 | 5 | | | 20.0 |
| | | Tarapoa, 1973 | 8,300 | 1 | 2 | | | 20.0 |
| | CEPE-ORIENT[e] | Bermejo Sur + Norte, 1967 | 5,000 | 21 | 26 | | | 32.5 |
| | | Charapa, 1967 | 10,000 | 1 | 4 | | | 29.5 |
| | | Cuyabeno, 1972 | 8,050 | 15 | 19 | | | 27.4 |
| | | Libertador | ... | 44 | 50 | | | 29.7 |
| | | Tetete-Tapi, 1980 | 9,300 | 6 | 11 | | | 29.1 |
| | CEPE-PENINSULA[e] | Ancon, 1921 | 4,000 | 439 | 439 | | | 35.7 |
| | | Carpel | ... | 99 | 99 | | | 36.4 |
| | | Cautivo | ... | 79 | 79 | | | 36.4 |
| | | **Total Ecuador** | | 947 | 1,022 | 286,000 | 1,613,724,900 | |
| **EGYPT** | GUPCO/AMOCO | Abu Gharadig, 1972 | 9,500 | 24 | 33 | 9,838 | 62,282,161 | 35.0-55.0 |
| | | • Badri (315), 1981 | 6,400 | 19 | 30 | 29,756 | 78,377,837 | 27.0 |
| | | • El Morgan, 1965 | 5,100-6,400 | 99 | 148 | 78,200 | 1,116,222,400 | 27.0-32.0 |
| | | • GH (376), 1981 | 8,200-9,750 | 1 | 5 | 128 | 6,199,904 | 24.0-28.0 |
| | | • GS (277) 1980 | 8,610 | 1 | 1 | 1,166 | 3,757,952 | 34.0 |
| | | • GS (345/346), 1982 | 7,500 | 1 | 2 | 314 | 1,340,653 | 35.0-38.0 |
| | | • GS (365), 1980 | 10,140 | ... | 1 | ... | 679,175 | 42.0 |
| | | • GS (381), 1985 | 8,700 | ... | 1 | ... | 1,333,673 | 37.0 |
| | | • GS-327, 1983 | 5,600 | 2 | 1 | 1,630 | 3,215,947 | 20.0 |
| | | • Hilal (404), 1982 | 9,200-10,000 | 5 | 9 | 27,324 | 67,436,731 | 32.0 |
| | | • July, 1973 | 8,100-10,000 | 30 | 55 | 56,315 | 511,229,420 | 33.0 |
| | | NAG-9/9-1, 1985 | 10,000 | 2 | 2 | 1,048 | 2,006,875 | 35.0 |
| | | NEAG-9/15, 1984 | 10,635-12,128 | 2 | 3 | 580 | 1,263,332 | 35.0 |
| | | • Nessim (336), 1981 | 6,700 | 1 | 3 | 226 | 8,967,040 | 29.0 |
| | | • October, 1978 | 11,000 | 37 | 42 | 153,759 | 445,997,930 | 27.0-31.0 |
| | | • Ramadan, 1974 | 11,400 | 23 | 30 | 29,900 | 406,807,025 | 30.5 |
| | | Razzak and E. Razzak, 1972 | 5,730-7,710 | 11 | 19 | 2,543 | 54,221,004 | 38.0 |
| | | • SB (305), 1981 | 8,100 | ... | 1 | ... | 2,043,837 | 27.0 |
| | | • SB (339), 1981 | 4,600 | 1 | 1 | 440 | 999,727 | 29.5 |
| | | • SB (367), 1984 | 7,500 | ... | 1 | ... | 1,312,941 | 39.0 |
| | | • SB-294, 1986 | 11,600 | 2 | 2 | 2,536 | 2,940,429 | 30.5 |
| | | • SB-374, 1981 | 10,200 | ... | 1 | ... | 66,506 | 30.0 |
| | | • SG-300, 1976 | 5,720-6,200 | 2 | 4 | 4,583 | 23,866,801 | 24.0 |
| | | • Shoab Ali, 1978 | 4,700-5,500 | 15 | 49 | 6,939 | 65,962,531 | 28.0-33.0 |
| | | • Sidki (382), 1977 | 10,500 | ... | ... | ... | 42,761,720 | 34.0 |
| | | WD-33, 1972 | 9,700 | ... | 1 | ... | 2,161,591 | 35.0 |
| | | WD-33/15, 1985 | 5,800 | 2 | 2 | 1,591 | 2,853,726 | 30.0 |
| | | • Waly (356), 1982 | 6,900 | 1 | 3 | 1,832 | 4,916,962 | 36.0 |
| | | • Younis (347), 1981 | 4,300 | 2 | 6 | 3,533 | 16,865,788 | 32.0 |
| | AGIP | Belayim Land, 1953 | 7,000-8,500 | 113 | 122 | 39,636 | 468,594,365 | 21.5 |
| | | • Belayim Marine, 1961 | 8,500 | 68 | 78 | 169,745 | 723,822,361 | 29.0 |
| | | Meleiha, 1972 | 5,950 | 47 | 53 | 17,119 | 22,286,666 | 41.5 |
| | WEPCO/PHILLIPS PETROLEUM | El Alamein, 1966 | 8,700 | 18 | 19 | 2,574 | 68,476,913 | 34.0 |
| | | Umbarka, 1976 | 10,700 | 5 | 6 | 3,905 | 9,209,358 | 44.0 |
| | | Yidma, 1971 | 9,000 | 4 | 5 | 658 | 22,309,954 | 43.6 |
| | BADR PETROLEUM/SHELL | Badr El Din, 1982 | 10,800 | 10 | 10 | 21,370 | 35,000,000 | 38.0 |
| | | Sitra, 1982 | ... | ... | ... | 548 | 200,000 | 40.0 |
| | SUESSO (ESSO) | • East Zeit, 1982 | 11,000 | 11 | 11 | 23,850 | 30,868,000 | 39.9 |
| | REPSOL[e] | Hayat, 1986 | 9,000 | 5 | 5 | | | 40.0 |
| | | Khalda, 1983 | 7,000 | 6 | 13 | | | 35.0 |
| | | Safir, 1986 | 12,000 | 1 | 1 | | | 38.0 |
| | | Safir North, 1986 | 11,600 | 3 | 3 | | | 36.0 |

WORLDWIDE PRODUCTION

| | | Name of field, discovery date | Depth, ft | No. of wells Producing | No. of wells Total | Production 1990 average b/d | Production Cumulative to Dec. 31, 1990 bbl | °API gravity |
|---|---|---|---|---|---|---|---|---|
| | | Salam, 1985 | 8,000 | 18 | 29 | | | 35.0 |
| | | Tut, 1987 | 9,000 | 5 | 5 | | | 35.0 |
| | | Tut West, 1988 | 9,000 | 1 | 1 | | | 35.0 |
| | SUCO[e] | • Ras Budran, 1978 | 12,500 | 17 | 20 | | | 23.0-24.0 |
| | | • LL 87-2, 1975 | 12,000 | ... | 1 | | | 34.0 |
| | | • Ras Fanar, 1978 | 3,000 | 5 | 6 | | | 30.0 |
| | | • Zeit Bay, 1981 | 6,000 | 22 | 32 | | | 34.5 |
| | OSOCO/TOTAL[e] | • Shukheir Bay, 1978 | 6,300 | 1 | 1 | | | 34.5 |
| | | • S. Ramadan, 1982 | 10,000 | 2 | 2 | | | 36.5 |
| | GEYSUM[e] | • Geysum, 1980 | 5,500 | 5 | 5 | | | 17.0 |
| | EGPC[e] | Gharib, 1938 | 2,200-4,500 | 81 | 215 | | | 24.3 |
| | | Bakr/W. Bakr, 1958/1978 | 3,200-1,500 | 48 | 83 | | | 18.0-19.0 |
| | | Umel Yusr, 1938 | 3,000-3,300 | 19 | 37 | | | 21.5 |
| | | Amer, 1965 | 3,500 | 21 | 39 | | | 21.5 |
| | | El Ayoun, 1968 | 3,300 | 5 | 12 | 176,201 | 906,922,600 | 22.0 |
| | | Kareem, 1958 | 2,300 | 6 | 35 | | | 16.6 |
| | | Kheir, 1973 | 1,050 | 1 | 4 | | | 28.5 |
| | | Shukheir, 1966 | 2,500 | 5 | 11 | | | 34.0 |
| | | Ras El Behar, 1983 | 4,500 | 6 | 11 | | | 32.5 |
| | | Esh Elmalaha | 3,700 | 2 | 2 | | | 44.0 |
| | | Sudr, 1946 | 2,600 | 12 | 20 | | | 21.6 |
| | | Asl, 1947 | 3,000 | 3 | 6 | | | 21.6 |
| | | Matarma, 1948 | 2,000 | 2 | 2 | | | 14.6 |
| | | El Khaligue, 1980 | 1,600 | ... | 1 | | | 29.4 |
| | | Abu Senan T&Y, 1981 | 6,000 | 12 | 20 | | | ... |
| | | Harghada, 1913 | ... | ... | ... | | | ... |
| | EPEDECO[e] | West Bakr, 1978 | 1,300-1,500 | 20 | 25 | | | 18.0 |
| | EGYPTCO[e] | Meleha, 1972 | 6,000 | 12 | 12 | | | 40.0 |
| | SHUKAIR MARINE CO.[e] | O. Suco | ... | 1 | 1 | | | ... |
| | EL ALAMEIN[e] | Mors | ... | 1 | 1 | | | ... |
| | | **Total Egypt** | | **907** | **1,421** | **872,000** | **5,275,804,037** | |
| **FRANCE** | ALSACE | All fields | ... | 13 | 20 | 251 | 3,199,113 | ... |
| | | Abandoned | ... | ... | ... | ... | 24,388,362 | ... |
| | AQUITAINE BASIN | Lacq Superiéur, 1949 | 2,170 | 41 | 71 | 930 | 26,552,807 | 22.3 |
| | | Parentis, 1954 | 7,710 | 51 | 105 | 5,565 | 201,938,186 | 33.4 |
| | | Lugos, 1956 | 5,250 | 18 | 25 | 438 | 10,457,760 | 20.8 |
| | | Cazaux, 1959 | 7,550 | 41 | 72 | 4,674 | 72,812,310 | 34.2/37.3 |
| | | Lavergne, 1962 | 11,480 | 4 | 6 | 310 | 12,508,313 | 41.7 |
| | | Pécorade, 1974 | 10,660 | 6 | 20 | 1,534 | 11,191,168 | 29.3 |
| | | Castéra-Lou, 1976 | 9,600 | 7 | 11 | 356 | 2,744,182 | 21.7 |
| | | Vic Bilh, 1979 | 7,100 | 31 | 45 | 3,533 | 19,369,344 | 26.6 |
| | | Lagrave, 1984 | 6,500 | 2 | 4 | 5,662 | 10,084,587 | 42.5 |
| | | Other | ... | 7 | 12 | 185 | 10,453,873 | ... |
| | | Abandoned | ... | ... | ... | 1 | 8,849,099 | ... |
| | PARIS BASIN | Coulommes, 1958 | 6,230 | 24 | 50 | 358 | 13,603,710 | 32.6 |
| | | Châteaurenard, 1958 | 1,800 | 22 | 46 | 352 | 5,149,717 | 27.5 |
| | | St. Martin de Bossenay, 1959 | 4,590 | 9 | 13 | 265 | 8,656,405 | 33.0 |
| | | Villeperdue, 1959 | 6,100 | 112 | 156 | 10,697 | 25,316,747 | 34.4 |
| | | St. Firmin-des-Bois, 1960 | 1,800 | 32 | 62 | 461 | 10,316,720 | 27.5 |
| | | Chuelles, 1961 | 1,800 | 28 | 68 | 395 | 7,279,367 | 27.5 |
| | | Courtenay, 1964 | 1,800 | 24 | 44 | 465 | 2,926,026 | 27.5 |
| | | Soudron, 1976 | 4,600 | 18 | 29 | 371 | 2,358,398 | 34.4 |
| | | Donnemarie, 1979 | 8,040 | 1 | 6 | 249 | 2,287,591 | 36.2 |
| | | Chaunoy, 1983 | 7,350 | 55 | 79 | 14,372 | 32,835,649 | 37.1 |
| | | St. Germain, 1984 | 7,200 | 9 | 15 | 597 | 2,503,678 | 36.0 |
| | | Champotran, 1985 | 8,400 | 9 | 14 | 713 | 1,141,622 | 31.1 |
| | | Donmartin-Lettree, 1985 | 7,020 | 4 | 4 | 728 | 851,502 | 35.0 |
| | | Fontaine-au-Bron, 1986 | 6,140 | 10 | 13 | 1,569 | 1,939,301 | 35.4 |
| | | L'Ile du Gord, 1986 | 7,260 | 7 | 9 | 639 | 469,140 | 35.0 |
| | | Vert le Grand, 1986 | 6,230 | 5 | 6 | 2,941 | 3,492,107 | 34.8 |
| | | Other | ... | 57 | 133 | 2,596 | 14,683,842 | ... |
| | | Abandoned | ... | ... | ... | ... | 11,114,009 | ... |
| | JURA & SOUTHEAST | All fields abandoned | ... | ... | ... | ... | 223,063 | ... |
| | | **Total France** | | **647** | **1,136** | **61,207** | **501,687,596** | |
| **GABON** | ELF | • Anguille, 1962 | 9,200 | | | | | 31.0 |
| | | • Anguille NE, 1968 | 7,500 | | | | | 32.3 |
| | | • Anguille SE, 1962 | 8,200 | | | | | 33.0 |
| | | • Ayol Marin, 1978 | 7,700 | | | | | 19.8 |
| | | • Baliste, 1975 | 4,900 | | | | | 27.5 |
| | | • Barbier, 1972 | 6,000 | | | | | 32.6 |
| | | Batanga, 1960 | 5,900 | | | | | 39.2 |
| | | • Baudroie Marine, 1968 | 7,500 | | | | | 29.7 |
| | | • Baudroie N., 1980 | 7,500 | | | | | 31.5 |

| | | Name of field, discovery date | Depth, ft | No. of wells | | Production | | °API gravity |
|---|---|---|---|---|---|---|---|---|
| | | | | Producing | Total | 1990 average b/d | Cumulative to Dec. 31, 1990 bbl | |
| | | • Brème, 1973 | 5,000 | 216 | 251 | 104,420 | 1,021,165,000 | 37.0 |
| | | Clairette, 1956 | 4,400 | | | | | 32.5 |
| | | • Dorée, 1972 | 7,300 | | | | | 30.4 |
| | | • Girelle, 1973 | 9,400 | | | | | 31.0 |
| | | • Gonelle, 1972 | 5,800 | | | | | 25.7 |
| | | • Grand-Anguille, 1963 | 8,400 | | | | | 31.1 |
| | | • Grondin Marine, 1971 | 7,500 | | | | | 26.6 |
| | | • Konzi, 1962 | 3,600 | | | | | 39.0 |
| | | • Mandaros, 1972 | 4,900 | | | | | 20.5 |
| | | M'Boumba, 1975 | 2,800 | | | | | 32.6 |
| | | • M'Bya Sud, 1969 | 6,700 | | | | | 36.2 |
| | | • Mérou Sardine, 1984 | 9,900 | | | | | 30.2 |
| | | M'Polunié, 1980 | 6,600 | | | | | 37.0 |
| | | M'Polunié W, 1982 | 1,700 | | | | | 18.0 |
| | | N'Tchengué, 1957 | 4,100 | | | | | 31.0 |
| | | N'Tchengué Océan, 1963 | 6,600 | | | | | 30.2 |
| | | Olendé, 1976 | 6,700 | | | | | 34.0 |
| | | • Pageau, 1972 | 11,500 | | | | | 19.8 |
| | | Port-Gentil Océan, 1964 | 6,000 | | | | | 32.2 |
| | | • Port-Gentil Sud Marine, 1975 | 7,500 | | | | | 32.1 |
| | | • Torpille, 1968 | 8,200 | | | | | 34.0 |
| | | • Torpille NE, 1982 | 8,200 | | | | | 32.3 |
| | SHELL GABON | Gamba/Ivinga, 1963 | 3,000-3,100 | 51 | 64 | 10,137 | 266,300,000 | 31.6 |
| | | Lucina, 1971 | 5,900 | 15 | 22 | 6,575 | 56,200,000 | 38.4 |
| | | Lucina W., 1982 | ... | ... | ... | 822 | 2,600,000 | 38.4 |
| | | Rabi, 1985 | ... | ... | ... | 126,795 | 68,280,000 | 34.3 |
| | AMOCO | Oguendjo B and C, 1981 | 5,000-6,000 | 17 | 19 | 8,839 | 41,315,045 | 36.0 |
| | | Oguendjo Z, 1988 | 5,000-6,000 | 2 | 2 | 4,251 | 1,551,453 | 36.0 |
| | BRITISH GAS | • Obando, 1984 | 8,650 | 2 | 2 | 2,315 | 2,756,929 | 32.0 |
| | | • Octopus, 1984 | 10,300 | 3 | 3 | 937 | 1,507,997 | 33.0 |
| | | • Pelican, 1985 | 9,300 | 4 | 4 | 5,579 | 8,040,527 | 31.0 |
| | | **Total Gabon** | | 310 | 387 | 270,670 | 1,469,735,951 | |
| **GHANA** | AGRI-PETCO | • Saltpond, 1977 | 8,500 | ... | 3 | ... | 3,938,000 | 36.0-39.0 |
| | | **Total Ghana** | | ... | 3 | ... | 3,938,000 | |
| **GERMANY** | BEB | Annaveen, 1963 | 4,428 | ... | 4 | ... | 500,468 | 33.8 |
| | | Barenburg, 1953 | 2,300-3,300 | 42 | 72 | 1,900 | 41,425,209 | 29.0 |
| | | Barver, 1963 | 3,640 | 2 | 5 | 27 | 512,667 | 32.8 |
| | | Bodenteich, 1960 | 4,641 | 1 | 2 | 13 | 366,374 | 31.1 |
| | | Eich, 1983 | 5,995 | 7 | 8 | 1,576 | 2,664,180 | 38.9 |
| | | Eilte-West, 1956 | 6,051 | 12 | 16 | 89 | 3,666,253 | 32.8 |
| | | Eldingen, 1949 | 5,028 | 31 | 41 | 631 | 21,492,847 | 36.5 |
| | | Elsfleth, 1956 | 5,175 | ... | 8 | 25 | 2,869,817 | 25.7 |
| | | Eystrup 2, 1960 | 3,526 | ... | 1 | ... | 444,778 | 17.4 |
| | | Eystrup 3-6, 1959 | 1,075 | 4 | 4 | 71 | 786,198 | 17.4 |
| | | Eystrup-Verden, 1977 | 3,526 | ... | 4 | ... | 180,333 | 17.1 |
| | | Georgsdorf, 1944 | 1,800-2,600 | 198 | 369 | 4,700 | 105,720,831 | 24.0-29.0 |
| | | Gross Lessen, 1969 | 3,300 | 6 | 11 | 605 | 21,452,711 | 30.0 |
| | | Hankensbüttel, Mitte, 1954 | 5,182 | 6 | 8 | 462 | 13,394,422 | 33.0 |
| | | Hankensbüttel-Nord, 1955 | 5,182 | 4 | 4 | 341 | 6,553,564 | 33.0 |
| | | Hankensbüttel, Ost, 1954 | 5,182 | 1 | 1 | 41 | 1,304,872 | 33.0 |
| | | Hebelermeer, 1955 | 3,899 | 5 | 15 | 81 | 4,579,768 | 27.3 |
| | | Hillerse-Nord, 1958 | 2,683 | 1 | 1 | 14 | 755,383 | 31.5 |
| | | Hillerse-West, 1957 | 6,077 | 1 | 1 | 2 | 30,474 | 43.1 |
| | | Hohenassel, 1943 | 1,706 | ... | 10 | 7 | 3,560,509 | 30.4 |
| | | Hohnebostel, 1969 | 8,341 | 2 | 6 | 40 | 1,167,064 | 41.0 |
| | | Königsgarten, 1984 | 6,236 | 3 | 3 | 204 | 322,104 | 38.1 |
| | | Lingen-Dal. (incl. Wd), 1942 | 3,129 | 36 | 128 | 134 | 17,059,643 | 31.1 |
| | | Lüben, 1955 | 3,950 | 8 | 10 | 654 | 11,115,806 | 35.0-38.0 |
| | | Lüben-West, 1958 | 4,690 | 5 | 6 | ... | 1,586,806 | 38.9 |
| | | Meerdorf, 1954 | 6,077 | 11 | 25 | 54 | 1,652,524 | 43.1 |
| | | Meppen-Schwefingen, 1959 | 4,257 | 22 | 24 | 830 | 13,121,027 | 29.8 |
| | | Mölme-Feldbergen, 1934 | 1,410 | 2 | 2 | 12 | 601,597 | 31.1 |
| | | Mölme-Wachtel, 1934 | 3,886 | 3 | 9 | 3 | 906,440 | 36.9 |
| | | Nienhagen, 1909 | 3,079 | 11 | 26 | 184 | 25,864,013 | 29.6 |
| | | Nienhagen-Dachtmissen, 1959 | 3,427 | 4 | 8 | 72 | 1,072,947 | 27.8 |
| | | Pfullendorf-Ostrach, 1962 | 3,558 | 14 | 23 | 131 | 2,622,850 | 37.7 |
| | | Pötrau, 1959 | 5,248 | ... | 1 | ... | 31,121 | 14.3 |
| | | Rühlermoor-Malm, 1962 | 4,519 | 7 | 10 | 177 | 6,606,642 | 31.7 |
| | | Rühlermoor-Valendis, 1949 | 2,381 | 242 | 443 | 10,801 | 143,678,244 | 24.6 |
| | | Rühme, 1954 | 1,950 | 39 | 47 | 850 | 10,966,472 | 33.4 |
| | | Steimbke-Alt + Nord, 1936 | 1,246 | 15 | 30 | 67 | 7,809,501 | 20.6 |
| | | Steimbke-Lichtenmoor, 1943 | 2,722 | 14 | 29 | 100 | 4,067,007 | 17.4 |
| | | Steimbke-Ost, 1959 | 4,428 | 3 | 8 | 49 | 3,760,584 | 30.5 |
| | | Stockstadt, 1952 | 5,402 | 7 | 21 | 114 | 7,791,645 | 39.6 |
| | | Suderbruch, 1949 | 5,175 | 42 | 61 | 499 | 23,922,843 | 31.1 |
| | | Sulingen, 1973 | 3,345 | 9 | 9 | 430 | 5,510,212 | 30.0 |
| | | Verel, 1957 | 5,084 | 5 | 15 | 144 | 5,845,468 | 25.5 |

WORLDWIDE PRODUCTION

|  |  |  |  | No. of wells |  | Production |  |  |
|---|---|---|---|---|---|---|---|---|
|  |  | Name of field, discovery date | Depth, ft | Producing | Total | 1980 average b/d | Cumulative to Dec. 31, 1980 bbl | °API gravity |
|  |  | Varloh, 1984 | 4,129 | 5 | 6 | 94 | 384,085 | 31.5 |
|  |  | Volkensen, 1960 | 7,540 | 4 | 4 | 71 | 833,279 | 22.9 |
|  |  | Wehrbleck, 1957 | 3,342 | 46 | 61 | 593 | 17,084,174 | 32.0 |
|  |  | Wietingsmoor, 1954 | 2,820 | 23 | 29 | 431 | 13,545,706 | 30.5 |
|  | MOBIL | Bavaria | 5,640-6,190 | ... | 20 | ... | 7,526,952 | 20.0 |
|  |  | Hannover | 980-6,630 | 51 | 68 | 867 | 31,613,436 | 25.0-35.0 |
|  |  | Hofolding, 1980 | 11,100 | 2 | 3 | 251 | 1,196,853 | 28.0-30.0 |
|  |  | Süd-Oldenburg, 1950 | 2,630-6,800 | 71 | 140 | 1,033 | 40,709,444 | 31.0-39.0 |
|  |  | Voigtei, 1953 | 960-1,900 | 74 | 105 | 691 | 25,385,230 | 32.0-34.0 |
|  |  | Weser Ems | 2,000-2,450 | 20 | 24 | 269 | 6,310,633 | 24.0 |
|  | RWE-DEA A.G. | Boostedt, 1952 | 5,900 | 24 | 43 | 458 | 18,735,350 | 32.0 |
|  |  | Hankensbuettel-Sued, 1954 | 4,900 | 36 | 77 | 1,647 | 83,873,701 | 27.0-35.0 |
|  |  | Hardesse, 1957 | 8,200 | 29 | 66 | 412 | 9,167,066 | 40.0 |
|  |  | Hohne, 1951 | 5,250 | 28 | 54 | 681 | 41,456,740 | 33.0 |
|  |  | Leiferde, 1956 | 2,600 | 21 | 42 | 373 | 20,660,987 | 33.0 |
|  |  | Mittelplate, 1987 | 7,500-9,360 | 5 | 6 | 5,212 | 5,402,715 | 19.3 |
|  |  | Oerrel-Sued, 1954 | 4,600 | 22 | 47 | 570 | 12,163,739 | 26.0 |
|  |  | Ploen-Ost, 1958 | 6,660 | 29 | 63 | 621 | 51,697,691 | 33.0 |
|  |  | Preetz, 1962 | 8,200 | 18 | 33 | 350 | 11,874,655 | 26.0 |
|  |  | Schwedeneck-See, 1978 | 4,900 | 15 | 18 | 6,016 | 15,319,839 | 28.0 |
|  |  | Wesendorf, 1943 | 4,650 | 14 | 36 | 369 | 17,783,355 | 25.0-40.0 |
|  |  | Other, 1935 | 2,300-8,200 | 14 | 59 | 391 | 31,432,381 | 19.0-37.0 |
|  | WINTERSHALL A.G. | Aitingen, 1977 | 6,232 | 4 | 4 | 772 | 4,860,092 | 31.1 |
|  |  | Aldorf, 1952 | 4,100 | 29 | 103 | 345 | 17,374,010 | 33.0 |
|  |  | Arlesried, 1964 | 4,920-6,550 | 12 | 18 | 414 | 14,341,477 | 38.5 |
|  |  | Bockstedt, 1954 | 4,264 | 23 | 48 | 946 | 21,542,482 | 27.4 |
|  |  | Dickel, 1953 | 3,936 | 42 | 59 | 283 | 6,929,917 | 28.3 |
|  |  | Dueste, 1954 | 3,936 | 40 | 71 | 266 | 12,347,650 | 33.0 |
|  |  | Eicklingen, 1937 | 2,460 | 9 | 13 | 44 | 3,696,484 | 30.0 |
|  |  | Emlichheim, 1944 | 3,116 | 89 | 127 | 3,053 | 46,612,952 | 24.5 |
|  |  | Hauerz, 1985 | 8,639 | 4 | 4 | 93 | 324,589 | 40.4 |
|  |  | Kirchdorf, 1982 | 5,737 | 1 | 1 | 13 | 65,562 | 38.5 |
|  |  | Landau, 1955 | 3,936 | 80 | 87 | 1,063 | 27,908,999 | 36.9 |
|  |  | Maximiliansau, 1959 | 2,100-5,363 | ... | ... | ... | 14,387 | 41.0 |
|  |  | Meckelfeld, 1954 | 6,396 | 12 | 27 | 220 | 14,197,039 | 27.5 |
|  |  | Moencherot, 1958 | 5,248 | 15 | 22 | 270 | 10,774,384 | 38.1 |
|  |  | Nienhagen, 1925 | 3,729 | 11 | 12 | 59 | 10,967,041 | 30.0 |
|  |  | Oberschwarzach, 1978 | 4,920 | 4 | 4 | 85 | 741,669 | 37.7 |
|  |  | Pattensen, 1954 | 2,165 | 6 | 7 | 50 | 1,096,324 | 29.3 |
|  |  | Rheinzabern, 1959 | 3,750-5,576 | 1 | 1 | 25 | 36,225 | 37.9 |
|  |  | Ruehlertwist, 1949 | 2,350-2,900 | 64 | 132 | 1,585 | 32,714,041 | 25.0 |
|  |  | Ruelzheim, 1984 | 7,544 | ... | 2 | ... | 40,818 | 37.7 |
|  |  | Schwabmünchen, 1976 | 4,428 | ... | 1 | ... | 39,491 | 25.7 |
|  |  | Schwedeneck, 1956 | 5,182 | 13 | 29 | 145 | 5,328,026 | 27.5 |
|  |  | Wathlingen, 1939 | 2,624 | 7 | 10 | 22 | 1,429,874 | 30.0 |
|  | DST | Bramberge, 1958 | 2,560-3,300 | 64 | 82 | 5,284 | 107,880,063 | 29.0 |
|  |  | Fronhofen, 1964 | 3,800 | 8 | 13 | 192 | 2,481,700 | 37.0 |
|  |  | Illmensee, 1967 | 3,800 | 2 | 5 | 41 | 1,042,781 | 37.0 |
|  |  | Markdorf, 1960 | 7,700 | ... | 2 | ... | 13,912 | 37.0 |
|  |  | Memmingen-M, 1958 | 5,000 | ... | 3 | ... | 446,484 | 37.0 |
|  | PREUSSAG | Allermöhe, 1979 | 6,700 | 1 | 4 | 72 | 444,066 | 28.0 |
|  |  | Assling, 1961 | 11,400 | 2 | 4 | 131 | 8,410,695 | 39.0 |
|  |  | Broistedt, 1937 | 2,600 | 3 | 17 | 27 | 1,354,600 | 33.0 |
|  |  | Darching, 1967 | 12,200 | 2 | 5 | 301 | 5,094,989 | 39.0 |
|  |  | Eddesse-Nord, 1950 | 460 | 31 | 87 | 126 | 5,817,960 | 26.0 |
|  |  | Höhenrain, 1962 | 12,900 | 1 | 4 | 23 | 1,979,337 | 39.0 |
|  |  | Höver, 1957 | 2,200 | 10 | 16 | 46 | 2,215,627 | 25.0 |
|  |  | Kronsberg, 1953 | 2,000 | 14 | 20 | 137 | 2,453,081 | 25.0 |
|  |  | Lehrte, 1952 | 4,000 | 10 | 23 | 56 | 3,231,842 | 31.0 |
|  |  | Oelheim-Süd/Rhät, 1968 | 2,000 | 23 | 25 | 604 | 8,285,714 | 33.0 |
|  |  | Reitbrook-Kreide, 1937 | 2,300 | 13 | 159 | 96 | 15,872,441 | 21.0 |
|  |  | Reitbrook-West, 1960 | 6,100 | 16 | 21 | 410 | 22,629,809 | 30.0 |
|  |  | Sinstorf, 1960 | 7,100 | 12 | 23 | 480 | 19,662,275 | 30.0 |
|  |  | Vorhop, 1952 | 5,000 | 21 | 38 | 794 | 18,258,502 | 39.0 |
|  |  | Vorhop-Knesebeck, 1958 | 4,100 | 23 | 35 | 1,501 | 20,439,803 | 35.0 |
|  | C. DEILMANN AG | Adorf, 1948 | 5,000 | 28 | 38 | 693 | 8,107,000 | 28.0 |
|  |  | Hummling, 1953 | 5,000-6,200 | 27 | 33 | 210 | 2,512,000 | 25.0-30.0 |
|  |  | Scheerhorn, 1949 | 3,550-3,750 | 103 | 154 | 2,000 | 47,198,000 | 30.0 |
|  | EAST GERMANY(e) | All fields | ... | ... | ... | 6,000 | 73,000,000 | ... |
|  |  | **Total Germany** |  | **2,258** | **4,146** | **76,561** | **1,806,416,493** |  |
| **GREECE** | N. AEGEAN PET. CORP. | • Prinos, 1974 | 8,000-10,000 | 13 | 15 | 16,441 | 76,373,150 | 28.5 |
|  |  | **Total Greece** |  | **13** | **15** | **16,441** | **76,373,150** |  |
| **GUATEMALA** | MINISTERIO DE ENERGIA Y MINAS | Caribe, 1981 | 6,830 | 3 | 3 | 863 | 3,364,463 | 22.0-24.0 |
|  |  | Rubelsanto, 1974 | 5,300 | 5 | 7 | 829 | 6,429,773 | 26.0-30.0 |
|  |  | San Diego, 1981 | 17,150 | ... | ... | ... | 106,753 | 35.0 |
|  |  | Tierra Blanca | 11,230 | 1 | 1 | 1,101 | 785,054 | 19.5-23.0 |

WORLDWIDE PRODUCTION

| | | | | No. of wells | | Production | | |
|---|---|---|---|---|---|---|---|---|
| | | Name of field, discovery date | Depth, ft | Producing | Total | 1980 average b/d | Cumulative to Dec. 31, 1980 bbl | °API gravity |
| | | Tortugas, 1973 | 2,300 | ... | ... | ... | 67,804 | 25.0 |
| | | West Chinaja, 1977 | 3,200-3,800 | 3 | 3 | 393 | 7,337,897 | 31.0-35.0 |
| | | Xan, 1985 | 8,427 | 2 | 2 | 682 | 511,493 | 17.0 |
| | | Yalpemech, 1980 | 15,351 | 1 | 1 | 86 | 164,982 | 31.0-35.0 |
| | | **Total Guatemala** | | 16 | 17 | 3,943 | 18,767,249 | |
| **HUNGARY** | OKGT/NKFV | Algyo, 1965 | 5,320-6,317 | 723 | 1,210 | 21,593 | 174,197,625 | 41.0 |
| | | Almosd, 1977 | 8,143 | 2 | 2 | 1 | 367 | 33.8 |
| | | Asotthalom, 1967 | 3,199 | 15 | 20 | 961 | 10,202,320 | 32.1 |
| | | Battonya, 1959 | 3,041 | 17 | 28 | 74 | 1,404,763 | 39.2 |
| | | Battonya East, 1970 | 2,913 | 114 | 126 | 936 | 3,848,833 | 45.4 |
| | | Csanadapaca, 1967 | 6,063 | 6 | 6 | 181 | 143,849 | 37.0 |
| | | Demjen, 1954 | 726-3,937 | 193 | 224 | 267 | 9,239,855 | 38.2 |
| | | Ferencszallas, 1969 | 7,001-7,674 | 29 | 52 | 463 | 3,054,192 | 41.1 |
| | | Ferencszallas East-Kiszombor, 1973 | 7,283 | 13 | 16 | 77 | 3,155,712 | 41.1 |
| | | Fuzesgyarmat, 1974 | 5,753-5,892 | 1 | 1 | 2 | 4,805 | 22.9 |
| | | Kaba South, 1978 | 6,548 | 3 | 4 | 206 | 709,467 | 34.1 |
| | | Kaszaper South, 1971 | 5,056 | 14 | 14 | 27 | 217,316 | 32.8 |
| | | Kelebia NE, 1968 | 3,113-3,258 | 4 | 4 | 38 | 1,083,245 | 37.0 |
| | | Kelebia South, 1970 | 2,428 | 6 | 8 | 257 | 3,236,223 | 17.4 |
| | | Kiskundorozsma, 1964 | 4,846-9,711 | 26 | 36 | 1,861 | 4,093,093 | 41.9 |
| | | Kismarja, 1979 | 2,178-2,536 | 27 | 36 | 71 | 1,156,456 | 25.1 |
| | | Martfu South, 1979 | 6,516 | 8 | 10 | 73 | 26,762 | 40.0 |
| | | Mezohegyes, 1960 | 3,504-3,589 | 6 | 9 | 64 | 1,324,674 | 38.9 |
| | | Mezosas, 1978 | 8,432 | 3 | 3 | 201 | 79,837 | 40.0 |
| | | Pusztafoldvar, 1958 | 5,341-5,536 | 69 | 107 | 427 | 15,411,992 | 30.2 |
| | | Ruzsa, 1979 | 6,445-9,403 | 3 | 3 | 307 | 135,788 | 45.4 |
| | | Szeged 1971 | 8,629 | 18 | 25 | 2,220 | 23,841,785 | 41.7 |
| | | Szeghalom, 1980 | 6,545-6,606 | 42 | 55 | 1,152 | 1,300,200 | 44.5 |
| | | Szolnok, 1953 | 5,994 | 3 | 6 | 2 | 1,118,000 | 30.0 |
| | | Totkomlos SW, 1966 | 5,991 | 4 | 6 | 6 | 378,379 | 37.0 |
| | | Ulles, 1962 | 5,848-7,464 | 35 | 39 | 5 | 68,590 | 36.0 |
| | | Other | ... | ... | ... | ... | 2,895,544 | ... |
| | OKGT/KFV | Belezna, 1963 | 8,176 | 5 | 31 | 8 | 283,054 | 41.1 |
| | | Budafa-Kiscsehi, 1936 | 2,713-4,167 | 123 | 514 | 597 | 41,570,828 | 41.1 |
| | | Bugac, 1970 | 4,924 | 1 | 5 | 2 | 82,983 | 38.2 |
| | | Buzsak, 1954 | 1,683 | ... | 17 | 4 | 234,389 | 17.4 |
| | | Kiskunhalas NE MZ, 1974 | 5,905 | 10 | 34 | 204 | 1,794,381 | 31.2 |
| | | Kiskunhalas NE PZ, 1974 | 6,119-6,594 | 22 | 74 | 864 | 9,086,012 | 27.5 |
| | | Lovaszi, 1940 | 3,510-4,301 | 75 | 479 | 443 | 49,828,477 | 41.3 |
| | | Mezocsokonya West, 1967 | 5,938 | ... | ... | 21 | 9,895 | 27.5 |
| | | Nagylengyel, 1951 | 5,545-8,235 | 71 | 460 | 5,004 | 128,534,063 | 16.0 |
| | | Ortahaza, 1970 | 4,580-6,089 | 10 | 36 | 117 | 4,127,418 | 36.2 |
| | | Ortahaza East, 1986 | 5,413 | 4 | 12 | 57 | 62,901 | 31.1 |
| | | Pusztaapati, 1973 | 8,300 | 2 | 11 | 32 | 1,036,499 | 22.3 |
| | | Szank, 1964 | 5,827-5,932 | 22 | 110 | 507 | 16,482,527 | 38.7 |
| | | Szank NW, 1977 | 5,495 | ... | ... | 48 | 913,598 | 41.1 |
| | | Szank West, 1966 | 6,106-6,201 | 1 | 10 | 8 | 19,234 | 28.7 |
| | | Tazlar, 1966 | 6,365-6,890 | 2 | 23 | 21 | 393,304 | 24.0 |
| | | Tazlar Nord, 1966 | 7,129-7,415 | 1 | 7 | 90 | 43,741 | 32.5 |
| | | Zalakaros-Savoly, 1979 | 5,463-5,791 | 6 | 34 | 1,112 | 2,865,329 | 20.7 |
| | | Other | ... | ... | ... | ... | 7,339,704 | ... |
| | | **Total Hungary** | • | 1,739 | 3,907 | 40,813 | 527,067,998 | |
| **INDIA** | WESTERN | Ankleshwar, 1960 | 1,969-6,564 | 124 | 293 | 14,676 | 43,475,676 | 40-43.0 |
| | | Balol, 1970 | 1,000-1,100 | 91 | 171 | 3,791 | 3,923,520 | 16.0 |
| | | Gandhar, 1984 | 9,846-12,145 | 39 | 106 | 21,154 | 18,614,760 | 46.0 |
| | | Jhalora, 1976 | 1,200-1,300 | 74 | 108 | 9,325 | 30,143,760 | 24-29.0 |
| | | Jotana, 1977 | 1,100-1,500 | 44 | 79 | 13,154 | 18,619,600 | 40.0 |
| | | Kadi, N., 1967 | 3,810-7,220 | 162 | 238 | 11,931 | 58,940,640 | 21.0 |
| | | Kadi, S., 1968 | 6,892-9,846 | – | 39 | – | 3,812,000 | 24.0 |
| | | Kalol, 1961 | 4,595-10,830 | 203 | 368 | 10,628 | 49,849,200 | 36-39.0 |
| | | Lanwa, 1972 | 950-1,140 | 71 | 106 | 3,125 | 2,108,160 | 15.0 |
| | | Motwan and Sisodara, 1974 | 1,500-1,700 | 26 | 62 | 3,469 | 17,253,240 | 48.0 |
| | | Nada, 1968 | 2,800-3,500 | 3 | 9 | 1,285 | 1,515,240 | 40.0 |
| | | Nawagam, 1963 | 4,595-10,174 | 64 | 133 | 2,664 | 27,274,320 | 35-37.0 |
| | | Sanand, 1962 | 4,267-10,174 | – | 88 | – | 10,317,000 | 28.0 |
| | | Santhal, 1971 | 1,000-1,100 | 77 | 147 | 8,520 | 31,780,760 | 17.0 |
| | | Sobhasan, 1968 | 4,595-9,846 | 77 | 135 | 12,392 | 8,322,840 | 29.0 |
| | | Viraj, 1978 | 4,595-4,923 | 25 | 30 | 2,686 | 5,731,580 | 20.0-24.0 |
| | EASTERN | Chang Pang, 1973 | 8,861-10,502 | 13 | 20 | 2,430 | 5,746,200 | ... |
| | | Geleki, 1968 | 9,518-14,789 | 77 | 173 | 6,756 | 32,617,920 | 30.0 |
| | | Lakwa-Lakhmani, 1964 | 6,564-14,113 | 222 | 377 | 28,877 | 162,079,440 | 33.0 |
| | | Rudrasagar, 1960 | 7,877-13,128 | 47 | 119 | 6,178 | 39,323,040 | 28.0 |
| | | Others | | 21 | 162 | 5,175 | 9,106,080 | ... |
| | BOMBAY OFFSHORE | • B-38 (Heera), 1977 | 4,267-6,564 | 45 | 65 | 27,909 | 56,706,040 | 37.0 |
| | | • Bombay High, 1974 | 3,282-7,877 | 313 | 507 | 402,797 | 1,234,971,800 | 39.0 |
| | | • Panna (North Bassein), 1976 | 4,923-7,549 | 7 | 14 | 2,825 | 1,895,880 | 38.0 |
| | | • Ratna, 1979 | 7,500 | 3 | 10 | 1,286 | 9,186,600 | 38.0 |
| | | • Others | | 4 | 5 | 622 | 322,080 | ... |

WORLDWIDE PRODUCTION

| | Name of field, discovery date | Depth, ft | No. of wells | | Production | | °API gravity |
|---|---|---|---|---|---|---|---|
| | | | Producing | Total | 1990 average b/d | Cumulative to Dec. 31, 1990 bbl | |
| **SOUTHERN** | Adiyakkam Mangalam, 1989 | 2,200 | 2 | 4 | 197 | 153,720 | 40-43 |
| | Lingala, 1989 | 2,100 | 1 | 3 | 205 | 109,800 | 40-43 |
| | Narimanam, 1985 | 6,236-7,549 | 15 | 24 | 5,753 | 3,769,800 | 43-45 |
| | Others | | 1 | 10 | 183 | 175,680 | 48-52 |
| **OTHER FIELDS** | Bakrol, 1966 | 2,626-9,846 | ... | 3 | ... | 37,000 | ... |
| | Digboi, 1980 | 300-7,500 | 228-468 | 563 | 86,361,895 | ... | |
| | Dikom, 1991 | 3,612 | ... | ... | ... | ... | ... |
| | Jorajan, 1967 | 7,000-11,500 | 130 | 204 | 21,659 | 80,465,535 | 25.0-34.0 |
| | Kathaloni, 1991 | 3,552 | ... | ... | ... | ... | ... |
| | Kathana, 1965 | 5,250-5,906 | ... | 33 | ... | 5,103,000 | 25.0 |
| | Kharsang/Ningru, 1976 | 3,300-5,000 | 26 | 39 | 827 | ... | ... |
| | Kholka, 1966 | 5,579-7,877 | ... | 19 | ... | 636,000 | ... |
| | Kosamba, 1963 | 1,313-8,533 | ... | 23 | ... | 978,000 | ... |
| | Moran, 1956 | 11,000 | 63 | 91 | 8,425 | 112,362,725 | ... |
| | Nakhorkatiya, 1953 | 9,500 | 196 | 335 | 23,065 | 376,392,725 | ... |
| | Wavel, 1962 | 4,595-7,220 | ... | ... | ... | 168,000 | ... |
| | **Total India** | | **2,514** | **4,828** | **664,56[illegible]** | **2,530,353,236** | |
| **INDONESIA** **PERTAMINA UEP I** | Besitang, 1977 | 3,973 | 3 | 16 | 21 | 2,201,000 | 51.5 |
| | Gebang, 1977 | 2,917 | 17 | 50 | 447 | 5,789,900 | 54.0 |
| | Kuala Simpang Barat, 1971 | 3,740-5,019 | 20 | 36 | 3,401 | 22,112,700 | 45.0 |
| | Kuala Simpang Timur, 1967 | ... | 4 | 23 | 22 | 1,375,300 | ... |
| | P. Tabuhan Barat, 1937 | 3,350-5,893 | 19 | 32 | 524 | 7,052,900 | 50.8 |
| | P. Tabuhan Timur, 1968 | ... | 31 | 113 | 647 | 20,355,000 | ... |
| | Rantau, 1929 | 2,764 | 84 | 492 | 3,873 | 241,067,800 | 45.3 |
| | Serang Jaya, 1926 | 3,701 | 20 | 79 | 313 | 3,868,800 | 47.6 |
| | Sungai Buluh, 1984 | 3,701 | 5 | 8 | 266 | 1,395,300 | ... |
| | Kuala Dalam, 1983 | ... | 16 | 19 | 596 | 1,728,900 | ... |
| | Pulau Panjang, 1928 | ... | ... | 64 | 2 | 14,653,000 | ... |
| | Securai, 1980 | ... | 7 | 14 | 334 | 11,191,600 | ... |
| **PERTAMINA UEP II** | Abab, 1951 | 6,000 | 17 | 95 | 388 | 38,872,800 | 36.0 |
| | Benakat, 1932 | 1,600 | 61 | 206 | 1,511 | 134,833,000 | 35.0 |
| | Jirak, 1930 | 2,300 | 35 | 155 | 339 | 51,983,000 | 35.0 |
| | Talang Akar, 1922 | 2,800 | 26 | 344 | 749 | 347,232,800 | 35.0 |
| | Deras, 1937 | ... | 2 | 4 | 79 | 1,649,100 | ... |
| | Dewa, 1936 | ... | 9 | 32 | 65 | 8,719,500 | ... |
| | Betun, 1935 | ... | 2 | 8 | 147 | 6,008,300 | ... |
| | Candi, 1937 | ... | 2 | 2 | 31 | 169,900 | ... |
| | Kruh N., 1936 | ... | 1 | 6 | 9 | 315,700 | ... |
| | Raja, 1950 | 6,000 | 20 | 101 | 1,352 | 32,418,300 | 38.0 |
| | Sukaraja, 1934 | ... | ... | ... | 43 | 1,474,600 | ... |
| | Bajubang, 1930 | ... | 17 | 111 | 321 | 41,076,500 | ... |
| | Betung Jambi, 1951 | ... | 9 | 201 | 95 | 2,562,600 | ... |
| | Kenali Asam, 1931 | 2,077 | 60 | 163 | 1,185 | 94,360,200 | 29.0 |
| | Ketaling Timur, 1982 | ... | 8 | 10 | 227 | 163,200 | ... |
| | Setiti, 1980 | ... | 7 | 20 | 169 | 2,766,200 | ... |
| | Sungai Gelam, 1958 | ... | 1 | 7 | 55 | 215,700 | ... |
| | Sungai Lilin, 1964 | ... | 23 | 27 | 686 | 3,852,900 | ... |
| | Tempino, 1931 | 1,647 | 47 | 161 | 941 | 86,972,300 | 23.0 |
| | Belimbing, 1965 | 5,371 | 7 | 29 | 758 | 21,388,200 | ... |
| | Benakat East, 1973 | ... | 27 | 52 | 1,083 | 17,628,400 | ... |
| | Benuang, 1942 | 6,103 | 33 | 46 | 377 | 7,901,800 | 35.1 |
| | Gn. Kemala, 1938 | 5,448 | 20 | 76 | 1,405 | 28,260,900 | 38.0 |
| | Kuang, 1940 | 5,249 | 6 | 16 | 369 | 7,389,500 | 25.1 |
| | Limau, 1928 | 3,896-4,626 | 58 | 261 | 1,803 | 189,227,100 | ... |
| | Ogan Timur, 1943 | 3,793 | 11 | 28 | 377 | 4,211,200 | 27.4 |
| | T. Miring, 1935 | 640 | 25 | 47 | 1,101 | 12,183,500 | ... |
| | Talang Jimar, 1937 | 4,123 | 35 | 304 | 1,201 | 172,160,700 | 31.0 |
| | Tanjung Tiga, 1938 | 3,750 | 37 | 107 | 977 | 58,261,700 | 28.0 |
| | Karangan, 1975 | ... | ... | ... | 84 | 1,027,200 | 23.0 |
| | Beringin, 1975 | ... | ... | ... | 921 | 420,900 | ... |
| | Betung, 1986 | ... | ... | ... | 245 | 750,000 | ... |
| | Limau Niru, 1954 | ... | ... | ... | 747 | 25,262,300 | ... |
| | Musi, 1985 | ... | ... | ... | 1,007 | 1,913,500 | ... |
| | Prabumulih Barat, 1953 | ... | ... | ... | 164 | 11,180,700 | ... |
| | Air Serdang, 1988 | ... | ... | ... | 150 | 195,100 | ... |
| | Anden, 1950 | ... | 3 | 8 | 107 | 5,602,900 | ... |
| | Bilimbing, 1952 | ... | 2 | 3 | 15 | 716,100 | ... |
| | Ukui/Pondok, 1950 | ... | 5 | 9 | 104 | 5,246,500 | ... |
| | Lirik, 1939 | 1,600 | 33 | 46 | 1,109 | 38,955,900 | 34.0 |
| | Molek, 1956 | 2,600 | 13 | 27 | 209 | 11,877,100 | 34.0 |
| | N. Pulai, 1941 | 1,800 | 15 | 39 | 343 | 37,450,000 | 34.0 |
| | S. Pulai, 1941 | 1,800 | 12 | 17 | 208 | 5,101,700 | 34.0 |
| | Sego, 1940 | 1,800 | 61 | 84 | 2,905 | 124,512,400 | 34.0 |
| **PERTAMINA UEP III** | Camara, 1976 | 3,984-7,104 | 19 | 34 | 625 | 6,101,200 | ... |
| | Jatibarang, 1969 | 3,053 | 86 | 141 | 3,318 | 86,931,400 | 29.0 |
| | Tugu Barat, 1979 | 3,014 | 13 | 22 | 1,532 | 5,500,000 | ... |
| | Kandang Haur Timur, 1979 | ... | 4 | 8 | 41 | 1,266,200 | ... |
| | MB STR, 1985 | ... | 15 | 15 | 5,180 | 7,490,400 | ... |
| | Pegaden, 1986 | ... | 1 | 2 | 66 | 90,900 | ... |
| | Randegan, 1973 | ... | 4 | 11 | 53 | 546,000 | ... |

# PRODUCTION

**WORLDWIDE PRODUCTION**

| | | | No. of wells | | Production | | |
|---|---|---|---|---|---|---|---|
| | Name of field, discovery date | Depth, ft | Producing | Total | 1980 average b/d | Cumulative to Dec. 31, 1980 bbl | °API gravity |
| | Kanwegan, 1926 | ... | ... | ... | 2,086 | 87,044,900 | ... |
| | Ledok, 1893 | ... | ... | ... | 118 | 25,207,900 | ... |
| | Nglobo, 1896 | ... | ... | ... | 236 | 5,359,600 | ... |
| | Semanggi, 1896 | ... | ... | ... | 34 | 5,446,300 | |
| **PERTAMINA UEP IV** | Bunyu Nibung, 1923 | 2,077 | 40 | 106 | 2,663 | 83,321,300 | 33.2 |
| | Sembakung, 1976 | 2,600 | 16 | 17 | 3,108 | 229,600 | 36.0 |
| | Tapa-Teritip, 1975 | ... | 10 | 20 | 244 | 471,700 | ... |
| | Bengkadulie, 1960 | 3,250 | 1 | 1 | 12 | 548,500 | 39.5 |
| | Sakimah | ... | 1 | 2 | 38 | 320,300 | ... |
| | Sangatta, 1939 | 1,842 | 39 | 95 | 2,492 | 22,770,100 | 33.0 |
| | Tanjung, 1938 | 2,296 | 57 | 85 | 1,462 | 103,545,800 | 39.9 |
| | Taplan Timur, 1967 | 4,396 | 11 | 20 | 577 | 5,860,600 | 38.8 |
| | Warukin, 1966 | 2,067 | 22 | 31 | 741 | 10,862,800 | 26.9 |
| | Dahor Selatan, 1966 | ... | 2 | 2 | 50 | 50,900 | ... |
| | Tanta, 1975 | ... | 1 | 1 | 8 | 6,900 | ... |
| | Kambitin, 1981 | 3,491 | 2 | 8 | 90 | 246,000 | ... |
| **PERTAMINA UEP V** | Klamono, 1936 | 574 | 53 | 67 | 967 | 35,616,500 | 19.0 |
| | Linda, 1977 | 3,281 | 10 | 16 | 426 | 1,154,100 | 19.0 |
| | Salawati, 1977 | ... | 7 | 16 | 679 | 29,142,900 | ... |
| | Sele, 1951 | 2,156 | 7 | 16 | 172 | 1,547,500 | 35.0 |
| **TOTAL CFP** | • Bekapai, 1972 | 4,600-15,600 | 42 | 45 | 9,671 | 163,700,000 | 40.0 |
| | • Handil, 1974 | 2,900-19,200 | 230 | 280 | 62,479 | 700,104,900 | 33.0 |
| | • Tambora, 1980 | 8,000-13,000 | 16 | 36 | 574 | 12,190,600 | 33.0 |
| | Tunu$^{(C)}$, 1985 | 8,001-13,000 | 5 | 26 | 1,474 | 538,000 | 55.0 |
| **ARCO** | Ardjuna, 1969 | 2,380-7,250 | 333 | 387 | 91,145 | 750,505,000 | 37.0 |
| | Arimbi, 1972 | 2,943 | 29 | 33 | 8,370 | 33,086,000 | 33.0 |
| | Bima, 1983 | 3,000-3,888 | 55 | 59 | 9,200 | 19,254,000 | 34.0 |
| | NWC, 1974 | 5,411-5,800 | 29 | 36 | 9,378 | 10,465,000 | 31.5 |
| **KODECO ENERGY** | Madura, 1975 | ... | 5 | 14 | 980 | 3,818,600 | ... |
| **AMOSEAS** | Anoa, 1984 | ... | 9 | 9 | 2,299 | 839,000 | ... |
| **AGL PETROLEUM (SERAM) LTD.** | Bula, 1897 | [illegible]-1,300 | 75 | 355 | 1,256 | 15,978,000 | 23.0 |
| **CHEVRON & TEXACO** | Batang, 1975 | 690 | 11 | 13 | 795 | 2,607,000 | 19.0 |
| | Benua, 1978 | 2,400 | 21 | 25 | 10,025 | 24,686,300 | 37.0 |
| | Beruk, 1974 | 1,750 | 21 | 28 | 12,934 | 55,632,200 | 38.0 |
| | Beruk NE, 1976 | 1,800 | 3 | 6 | 55 | 1,766,500 | 40.0 |
| | Beruk North, 1985 | 1,900 | 6 | 7 | 1,546 | 1,381,700 | 38.0 |
| | Busya, 1978 | 2,035 | ... | 2 | ... | 191,000 | 28.0 |
| | Bungsu, 1976 | 2,050 | 7 | 8 | 701 | 11,625,200 | 38.0 |
| | Butun, 1982 | 4,000 | 9 | 9 | 19,351 | 9,173,000 | 44.0 |
| | Damar, 1974 | 4,650 | 5 | 6 | 471 | 4,950,900 | 34.0 |
| | Dusun, 1979 | 2,550 | 6 | 7 | 732 | 5,979,300 | 42.0 |
| | Gatam, 1977 | 2,365 | ... | 3 | ... | 627,200 | 34.0 |
| | Idris, 1983 | 2,450 | 1 | 3 | 400 | 916,100 | 39.0 |
| | Jingga, 1984 | 6,500 | 3 | 3 | 1,702 | 1,204,400 | 45.0 |
| | Kasikan, 1972 | 660 | 22 | 29 | 1,189 | 6,954,600 | 28.0 |
| | Langgak, 1976 | 1,380 | 26 | 28 | 2,263 | 6,396,600 | 32.0 |
| | Lindai, 1971 | 1,100 | 18 | 20 | 1,165 | 7,566,300 | 32.0 |
| | Menggala S., 1968 | 3,765 | 2 | 2 | 673 | 16,187,700 | 34.0 |
| | Mengkapan, 1981 | 4,000 | 1 | 1 | 301 | 1,139,900 | 44.0 |
| | Osam, 1978 | 900 | 6 | 7 | 203 | 1,062,900 | 32.0 |
| | Paitan, 1978 | 2,315 | 1 | 1 | 164 | 864,100 | 32.0 |
| | Pedada, 1973 | 950 | 30 | 31 | 11,345 | 77,118,200 | 33.0 |
| | Pusaka, 1977 | 2,250 | 20 | 25 | 7,575 | 17,421,200 | 36.0 |
| | Rintis, 1984 | 6,450 | 1 | 1 | 265 | 237,800 | 39.7 |
| | Sabak, 1974 | 2,350 | 16 | 17 | 1,408 | 19,612,000 | 36.0 |
| | Tanjung Medan, 1976 | 2,770 | 2 | 7 | 678 | 2,578,600 | 34.0 |
| | Terantam, 1973 | 900 | 4 | 6 | 304 | 866,500 | 32.0 |
| | Zamrud, 1975 | 3,600 | 52 | 55 | 19,299 | 78,986,600 | 40.0 |
| | Ujung Tanjung, 1975 | 3,600 | 1 | 3 | 270 | 98,500 | 34.0 |
| | Pak, 1968 | 3,667 | 2 | 2 | 315 | 114,900 | 35.0 |
| **CALTEX PACIFIC INDONESIA** | Ampuh, 1981 | 6,000 | 10 | 14 | 2,142 | 3,042,000 | 38.0 |
| | Antara, 1978 | 1,425 | 5 | 6 | 916 | 4,242,500 | 36.0 |
| | Balam S., 1969 | 1,600 | 59 | 62 | 9,178 | 105,156,600 | 33.0 |
| | Balam SE, 1972 | 4,500 | 13 | 13 | 618 | 7,112,500 | 29.0 |
| | Bengko, 1970 | 1,950 | 86 | 97 | 27,223 | 366,499,300 | 34.0 |
| | Batang CPI, 1975 | 690 | 7 | 7 | 608 | 1,363,000 | 19.0 |
| | Bekasap, 1955 | 2,950 | 52 | 68 | 16,563 | 419,807,600 | 34.0 |
| | Bekasap South, 1968 | 3,900 | 6 | 14 | 844 | 27,822,900 | 34.0 |
| | Benar, 1973 | 2,450 | 28 | 34 | 4,176 | 60,600,100 | 33.0 |
| | Cebakan, 1974 | 4,700 | 4 | 5 | 520 | 4,643,900 | 30.0 |
| | Aman, 1974 | 4,700 | 10 | 10 | 1,272 | 27,546,100 | 39.0 |
| | Cucut, 1981 | 5,800 | 2 | 3 | 403 | 279,200 | 33.0 |
| | Duri, 1941 | 770 | 1,558 | 2,042 | 165,200 | 581,682,000 | 22.0 |
| | Garuk, 1980 | 4,600 | ... | 2 | ... | 119,200 | 31.0 |
| | Hitam, 1975 | 6,690 | 4 | 5 | 1,011 | 2,755,800 | 39.0 |
| | Hiu, 1983 | 5,900 | 3 | 4 | 1,074 | 1,124,600 | 40.0 |
| | Intan, 1977 | 3,350 | 6 | 7 | 1,427 | 7,843,000 | 33.0 |
| | Jorang, 1972 | 5,500 | 17 | 21 | 9,346 | 43,636,300 | 38.0 |
| | Kerang, 1977 | 3,900 | 11 | 14 | 1,922 | 6,840,400 | 39.0 |

WORLDWIDE PRODUCTION

| | | | | | Production | | |
|---|---|---|---|---|---|---|---|
| | | | — No. of wells — | | 1990 average | Cumulative to Dec. 31, 1990 | |
| | Name of field, discovery date | Depth, ft | Producing | Total | b/d | bbl | °API gravity |
| | Koper, 1974 | 5,300 | 12 | 24 | 4,381 | 15,400,000 | 37.0 |
| | Kotabatak, 1952 | 5,500 | 88 | 141 | 20,096 | 150,559,000 | 29.0 |
| | Kulin, 1970 | 2,050 | 63 | 71 | 5,501 | 35,355,800 | 20.9 |
| | Libo, 1988 | 6,000 | 2 | 12 | 830 | 7,025,000 | 35.0 |
| | Libo SE, 1973 | 5,900 | 22 | 29 | 8,096 | 7,909,300 | 42.0 |
| | Lincak, 1981 | 2,570 | 4 | 4 | 288 | 2,984,300 | 35.0 |
| | Menggala N., 1968 | 3,850 | 18 | 22 | 3,928 | 67,028,900 | 33.0 |
| | Menggala S. CPI, 1968 | 3,765 | 6 | 9 | 1,299 | 32,808,900 | 34.0 |
| | Minas, 1944 | 2,600 | 460 | 627 | 284,701 | 3,521,093,800 | 35.0 |
| | Mindal, 1971 | 3,400 | 2 | 5 | 41 | 3,119,900 | 37.0 |
| | Mutiara, 1976 | 3,500 | 2 | 2 | 9 | 1,901,300 | 34.0 |
| | Nella, 1977 | 5,000 | 3 | 5 | 33 | 870,100 | 35.0 |
| | Obor, 1978 | 7,370 | 2 | 4 | 543 | 2,534,500 | 40.0 |
| | Pager, 1974 | 4,300 | 25 | 28 | 6,506 | 80,812,800 | 38.0 |
| | Pelita, 1977 | 6,600 | 4 | 7 | 820 | 4,771,200 | 39.0 |
| | Pematang, 1959 | 3,750 | 34 | 46 | 7,432 | 224,473,500 | 32.0 |
| | Pematang Bow, 1969 | 5,300 | 11 | 19 | 1,934 | 8,600,800 | 33.0 |
| | Pemburu, 1981 | 2,300 | 10 | 11 | 2,778 | 11,177,300 | 35.0 |
| | Perkebunan, 1977 | 2,300 | 1 | 1 | 168 | 379,400 | 29.0 |
| | Petani, 1964 | 4,750 | 35 | 38 | 11,493 | 282,054,200 | 33.0 |
| | Petapahan, 1971 | 4,500 | 21 | 32 | 4,529 | 96,200,100 | 28.0 |
| | Pinang, 1971 | 3,950 | 18 | 22 | 3,796 | 28,661,600 | 30.0 |
| | Pinggir, 1972 | 3,300 | 3 | 7 | 170 | 4,604,800 | 35.0 |
| | Pinggir S., 1973 | 3,300 | 2 | 4 | 62 | 2,071,600 | 39.0 |
| | Pudu, 1972 | 5,950 | 7 | 13 | 1,406 | 29,040,100 | 35.0 |
| | Puncak, 1979 | 2,400 | 15 | 18 | 2,956 | 16,288,200 | 36.0 |
| | Pungut, 1951 | 3,400 | 26 | 34 | 4,193 | 49,582,600 | 38.0 |
| | Rangau, 1968 | 6,100 | 3 | 13 | 345 | 8,536,000 | 42.0 |
| | Rantaubais, 1972 | 1,070 | 14 | 18 | 524 | 1,037,400 | 18.0 |
| | Rokan, 1979 | 6,100 | 1 | 4 | 523 | 1,022,800 | 41.0 |
| | Mangasa, 1988 | 7,800 | 1 | 1 | 345 | 126,000 | 34.0 |
| | Seruni, 1972 | 3,000 | 23 | 25 | 7,059 | 50,193,700 | 35.0 |
| | Sikladi, 1975 | 4,340 | 19 | 21 | 2,219 | 21,100,200 | 40.0 |
| | Singa, 1977 | 3,200 | 1 | 2 | ... | 437,000 | 31.0 |
| | Sintong, 1971 | 3,400 | 24 | 25 | 2,733 | 56,929,500 | 32.0 |
| | Sintong SE, 1973 | 4,500 | 1 | 1 | 85 | 1,230,100 | 36.0 |
| | Suram, 1971 | 1,750 | 3 | 7 | 284 | 3,824,500 | 28.0 |
| | Tandun, 1969 | 3,000 | 12 | 13 | 2,184 | 14,416,000 | 33.0 |
| | Telinga, 1975 | 4,205 | 7 | 10 | 625 | 3,786,600 | 33.0 |
| | Topaz, 1977 | 5,200 | 7 | 8 | 1,807 | 17,743,500 | 33.0 |
| | Topi, 1979 | 3,630 | 1 | 1 | 88 | 598,600 | 37.0 |
| | Tunas, 1983 | 4,819 | 2 | 2 | 279 | 399,100 | 35.0 |
| | Ubi, 1976 | 4,350 | 24 | 25 | 2,557 | 14,931,300 | 35.0 |
| | Waduk, 1982 | 6,100 | 9 | 13 | 135 | 4,860,300 | 38.0 |
| | Tanggul, 1977 | 3,700 | 2 | 2 | 436 | 159,400 | 30.0 |
| **ASAMERA (NORTH SUMATRA)** | Alur Cimon, 1972 | 3,098 | ... | 34 | ... | 4,379,000 | 50.8 |
| | Geudondong, 1965 | 3,192 | ... | 32 | ... | 5,200,000 | 23.1 |
| | Iee Tabeu, 1971 | 2,721 | 2 | 73 | 16 | 11,904,400 | 50.3 |
| | Julu Rayeu, 1968 | 2,832 | 7 | 65 | 282 | 12,425,500 | 53.6 |
| | Peudawa, 1980 | 3,083 | ... | 30 | ... | 1,567,400 | 48.1 |
| | Tualang, 1973 | 2,631 | 11 | 75 | 1,033 | 30,900,700 | 49.9 |
| **ASAMERA (SOUTH SUMATRA)** | Bentayan, 1932 | 4,446 | 15 | 24 | 2,285 | 2,391,200 | 22.0 |
| | Keri, 1985 | 3,957 | 2 | 3 | 80 | 106,200 | 41.5 |
| | Kluang, 1913 | 2,591 | 25 | 54 | 505 | 34,224,500 | 42.6 |
| | Mangunjaya, 1934 | 2,700 | 5 | 109 | 173 | 23,145,900 | 32.0 |
| | Panerokan, 1976 | 4,915 | 2 | 8 | 23 | 206,800 | 39.4 |
| | Ramba, 1982 | 3,150 | 62 | 78 | 13,001 | 55,329,000 | 37.0 |
| | Rawa, 1985 | 4,038 | 22 | 41 | 6,685 | 6,506,300 | 38.7 |
| | South Rawa, 1985 | 4,086 | 2 | 3 | 165 | 178,200 | 37.0 |
| | Supat, 1984 | 4,626 | 10 | 12 | 1,955 | 998,000 | 33.6 |
| | Tanjung Laban, 1982 | 3,590 | 21 | 30 | 885 | 6,887,300 | 38.1 |
| | Tempino, 1931 | 4,493 | 3 | 192 | 148 | 1,457,400 | 40.9 |
| **MAXUS ENERGY** | • Cinta, 1970 | 3,500 | 45 | 60 | 16,118 | 186,121,000 | 34.0 |
| | • Duma, 1983 | 2,300 | 2 | 6 | 49 | 765,000 | 24.0 |
| | • Farida, 1982 | 8,000 | 11 | 22 | 3,019 | 13,957,000 | 32.0 |
| | • Gita, 1972 | 5,000 | 5 | 9 | 529 | 7,925,000 | 34.5 |
| | • Intan, 1989 | 5,000 | 15 | 16 | 32,868 | 18,534,000 | 32.6 |
| | • Karmila, 1983 | 4,800 | 4 | 8 | 4,532 | 33,972,000 | 36.0 |
| | • Kitty, 1973 | 2,700 | 6 | 8 | 1,159 | 14,805,000 | 38.0 |
| | • Krisna, 1979 | 4,500 | 23 | 43 | 6,614 | 64,631,000 | 37.0 |
| | • Nora, 1973 | 3,200 | 3 | 5 | 482 | 9,138,000 | 29.0 |
| | • Rama, 1974 | 3,200 | 32 | 73 | 6,296 | 95,856,000 | 31.0 |
| | • Selatan, 1971 | 4,000 | 7 | 19 | 808 | 21,468,000 | 19.0 |
| | • Sundari, 1982 | 4,400 | 9 | 15 | 1,767 | 12,471,000 | 25.0 |
| | • Titi, 1982 | 8,000 | ... | 5 | ... | 1,656,000 | 33.0 |
| | Wanda, 1984 | 4,800 | 1 | 5 | 38 | 1,651,000 | 38.0 |
| | • Yvonne, 1980 | 4,500 | 8 | 11 | 2,792 | 14,744,000 | 36.0 |
| | • Zelda, 1971 | 7,500 | 23 | 47 | 6,277 | 41,457,000 | 33.0 |
| | • Intan NE, 1989 | 5,000 | 6 | 6 | 104 | 38,000 | 32.6 |
| | • Widuri, 1989 | 5,000 | 30 | 35 | 10,951 | 3,997,000 | 24.0 |
| **PETROMER TREND** | Candrawasih, 1976 | 3,500 | 16 | 27 | 1,232 | 13,310,800 | 26.7 |
| | Jaya, 1973 | 3,050 | 13 | 21 | 1,009 | 36,547,200 | 39.7 |

| | | | No. of wells | | Production | | |
|---|---|---|---|---|---|---|---|
| | Name of field, discovery date | Depth, ft | Producing | Total | 1990 average b/d | Cumulative to Dec. 31, 1990 bbl | °API gravity |
| | Kasim, 1972 | 3,350 | 40 | 57 | 2,762 | 49,518,200 | 36.5 |
| | Kasim Barat, 1975 | 4,412 | 1 | 7 | 139 | 3,040,700 | 33.3 |
| | Kasim Utara, 1975 | 5,058 | 3 | 11 | 182 | 8,335,300 | 26.4 |
| | Klaserai, 1981 | 2,900 | ... | ... | ... | 25,300 | 32.5 |
| | Moi, 1979 | 4,731 | 4 | 8 | 166 | 799,700 | 19.4 |
| | Walio, 1975 | 2,750 | 247 | 297 | 12,690 | 161,564,800 | 34.3 |
| STANVAC (CENTRAL SUMATRA) | Binio, 1972 | 1,600 | 13 | 37 | 342 | 12,101,000 | 34.0 |
| | E. Kayuara, 1983 | 3,500 | 45 | 64 | 3,167 | 9,670,000 | 35.0 |
| | Gemuruh, 1983 | 2,800 | 16 | 22 | 1,121 | 3,150,000 | 34.0 |
| | K. Ara, 1980 | 3,944 | 7 | 18 | 268 | 2,249,000 | 35.4 |
| | Kerumutan, 1980 | 3,000 | 11 | 42 | 611 | 5,623,000 | 35.0 |
| | Merbau, 1979 | 2,700 | 30 | 47 | 998 | 7,496,000 | 36.0 |
| | Mutiara, 1985 | 2,700 | 2 | 2 | 44 | 148,000 | 34.0 |
| | N. Merbau, 1980 | 2,600 | 6 | 17 | 345 | 3,063,000 | 36.0 |
| | Panduk, 1981 | 2,500 | 6 | 12 | 219 | 1,669,000 | 46.0 |
| | Parum, 1987 | 4,200 | 16 | 23 | 2,449 | 2,278,000 | 35.0 |
| | Pekan, 1976 | 3,700 | 13 | 48 | 414 | 8,135,000 | 35.0 |
| STANVAC (SOUTH SUMATRA) | Gunung Kembang, 1979 | 4,000 | 3 | 6 | 274 | 117,000 | 36.0 |
| | Ibul, 1970 | 5,700 | 16 | 54 | 619 | 22,420,000 | 36.0 |
| | Jene, 1985 | 6,500 | 24 | 47 | 17,178 | 27,178,080 | 35.0 |
| | • Kerang (PSC), 1984 | 2,900 | 4 | 7 | 466 | 1,344,000 | 35.0 |
| | Lagan, 1986 | 2,400 | 5 | 8 | 236 | 390,000 | 56.8 |
| | Pian, 1986 | 6,000 | 4 | 10 | 499 | 279,000 | 36.0 |
| | Rambutan, 1972 | 4,500 | 6 | 24 | 99 | 3,225,000 | 42.0 |
| | Rimbabat (PSC), 1984 | 3,200 | 3 | 4 | 110 | 204,000 | 34.0 |
| | S. Tabuan, 1980 | 3,000 | 1 | 5 | 27 | 45,000 | ... |
| | • Tabuan (PSC) | 4,000 | 6 | 11 | 548 | 1,977,000 | 34.0 |
| | Teras, 1951 | 3,000 | 3 | 4 | 121 | 833,000 | 37.0 |
| VIRGINIA INDONESIA | Badak, 1972 | 5,190-10,600 | 135 | 168 | 13,151 | 83,400,000 | 34.4 |
| | Mutiara, 1984 | 900-5,800 | 8 | 38 | 3,014 | 6,100,000 | 38.5 |
| | Nilam, 1974 | 7,500-11,500 | 90 | 115 | 15,890 | 42,200,000 | 33.4 |
| | Pamaguan, 1974 | 900-5,100 | 14 | 32 | 1,644 | 8,000,000 | 26.8 |
| | Semberah, 1974 | 2,900-10,100 | ... | 38 | ... | 565,000 | 30.0 |
| | Wailawi, 1974 | 5,000-6,000 | 6 | 6 | 6 | 46,200 | 32.0 |
| UNOCAL | • Attaka, 1970 | 7,500 | 90 | 121 | 50,978 | 503,615,000 | 39.0 |
| | • Kerindingan, 1972 | 7,000 | ... | 14 | ... | 5,034,000 | 23.8 |
| | • Melahin, 1972 | 7,500 | 4 | 9 | 732 | 7,054,000 | 23.1 |
| | • Rajah, 1981 | 5,500 | ... | ... | ... | ... | 33.8 |
| | • Sepinggan, 1973 | 11,150 | 34 | 39 | 18,592 | 58,232,000 | 34.0 |
| | • Yakin, 1976 | 5,100 | 20 | 38 | 5,496 | 25,617,000 | 18.8 |
| CONOCO GROUP | • Ikan Pari, 1983 | 4,500 | 4 | 4 | 6,200 | 3,052,700 | 47.0 |
| | • Kepiting, 1982 | 6,000 | ... | 2 | ... | 2,563,200 | 37.0 |
| | • Udang, 1974 | 5,595 | 17 | 28 | 3,468 | 61,367,000 | 40.0 |
| | Wiriagar, 1984 | 3,500 | 3 | 3 | 2,575 | 939,700 | 39.7 |
| MOBIL OIL | Arun[(c)], 1971 | 10,050 | 54 | 89 | 121,392 | 425,500,000 | 55.0 |
| MARATHON | • Kakap KH, 1980 | 8,500 | 8 | 8 | 5,260 | 17,489,000 | 45.0 |
| | • Kapap KF, 1984 | 8,100 | 14 | 14 | 27,041 | 9,923,700 | 49.0 |
| HUDBAY (MALACCA STRAIT) | • Kurau, 1986 | 4,500-9,000 | 20 | 22 | 26,259 | 22,484,700 | 47.4 |
| | • Lalang, 1980 | 3,100-3,600 | 11 | 18 | 5,531 | 38,418,800 | 39.6 |
| | • Melibur, 1984 | 900-1,300 | 17 | 25 | 8,042 | 12,035,500 | 35.6 |
| | • Mengkapan, 1981 | 3,850-4,450 | 9 | 10 | 6,044 | 22,706,200 | 42.0 |
| | Selatan, 1987 | 3,900-4,500 | 8 | 14 | 207 | 455,700 | ... |
| TESORO INDONESIA PETROLEUM | Semboja, 1909 | 360-4,380 | 26 | 99 | 2,263 | 266,376,000 | 25.0 |
| | Sanga Sanga, 1897 | 275-6,000 | 108 | 244 | 1,959 | 192,593,000 | 31.0 |
| | Tarakan, 1906 | 200-6,540 | 122 | 1,167 | 922 | 74,678,000 | 19.0 |
| TARAKAN PETROLEUM | Tarakan (Mamburungan field), 1984 | 5,020-5,131 | 2 | 4 | 537 | 285,000 | 31.1 |
| | Total Indonesia | | 7,262 | 14,898 | 1,498,725 | 14,143,634,380 | |

## IRAN

| | Name of field, discovery date | Depth, ft | Producing | Total | 1990 average b/d | Cumulative to Dec. 31, 1990 bbl | °API gravity |
|---|---|---|---|---|---|---|---|
| NIOC | • Aboozar, 1969 | 2,800 | ... | ... | | | 27.0 |
| | Agha Jari, 1936 | 7,440 | 58 | 89 | | | 34.0 |
| | Ahwaz Asmari, 1958 | 8,150 | 73 | 86 | | | 32.0 |
| | Ahwaz Bangestan, 1958 | 12,000 | ... | 7 | | | 24.3 |
| | • Bahregansar, 1960 | 9,000 | ... | ... | | | 30.0 |
| | Bibi Hakimeh, 1961 | 4,570 | 19 | 33 | | | 29.9 |
| | Binak, 1959 | 10,440 | ... | 4 | | | 29.9 |
| | Cheshmeh Khush, 1967 | 10,700 | ... | 4 | | | 27.7 |
| | Chillingar, 1974 | 3,350 | ... | 1 | | | 39.3 |
| | • Cyrus, 1962 | 7,000 | ... | ... | | | 18.3 |
| | • Darius, 1961 | 11,000 | ... | ... | | | 34.0 |
| | Dehluran, 1972 | 11,900 | ... | 6 | | | 31.0 |
| | • Forozan, 1966 | 7,000 | ... | ... | | | 28.5 |
| | Gachsaran, 1937 | 3,400 | 46 | 62 | | | 31.0 |
| | Haft Kel, 1927 | 1,980 | 2 | 11 | | | 37.7 |
| | • Hendijan, 1968 | 11,000 | ... | ... | | | 23.0 |
| | Karanj, 1963 | 5,360 | 7 | 7 | | | 33.9 |
| | Kharg, 1961 | 10,900 | ... | ... | | | 31.6 |
| | Kupal, 1965 | 10,500 | ... | 7 | | | 32.8 |
| | Lab-e Safid, 1966 | 4,350 | ... | 7 | 3,252,000 | 38,179,417,064 | 35.3 |

**WORLDWIDE PRODUCTION**

| | | Name of field, discovery date | Depth, ft | No. of wells — Producing | No. of wells — Total | Production — 1990 average b/d | Production — Cumulative to Dec. 31, 1990 bbl | °API gravity |
|---|---|---|---|---|---|---|---|---|
| | | Mansuri, 1963 | 7,100 | 4 | 8 | | | 28.4 |
| | | Marun, 1963 | 9,400 | 55 | 112 | | | 32.6 |
| | | Masjid-e Suleiman, 1908 | 1,600 | 7 | 24 | | | 39.3 |
| | | Naft Safid, 1938 | 5,000 | 5 | 10 | | | 36.8 |
| | | Naft-Shahre, 1923 | 2,000-3,000 | ... | ... | | | 43.0 |
| | | • Nowruz, 1966 | 8,200 | ... | ... | | | 21.0 |
| | | Par-e Siah, 1964 | 4,250 | ... | 1 | | | 37.7 |
| | | Paris, 1964 | 4,670 | 22 | 27 | | | 36.8 |
| | | Pazanan, 1961 | 7,250 | 44 | 71 | | | 37.2 |
| | | Rag-e Safid, 1964 | 7,230 | 19 | 29 | | | 28.6 |
| | | Ramin, 1966 | 12,200 | ... | ... | | | 32.9 |
| | | Ramshir, 1962 | 8,750 | ... | 3 | | | 27.6 |
| | | • Resalat, 1969 | 7,650 | ... | ... | | | 35.8 |
| | | • Reshadat, 1966 | 7,000 | ... | ... | | | 34.4 |
| | | • Salman, 1965 | 7,500-8,100 | ... | ... | | | 34.0 |
| | | Shadegan, 1989 | .. | ... | ... | | | ... |
| | | Soroush, 1962 | 7,000 | ... | ... | | | 18.3 |
| | | Sulabedar, 1971 | 3,400 | ... | ... | | | 30.4 |
| | | **Total Iran** | | **361** | **618** | **3,252,000** | **35,179,417,094** | |
| **IRAQ(•)** | INOC | Abu Ghurab, 1971 | 9,800 | 12 | 16 | 2,080,000 | 22,430,413,000 | 24.0 |
| | | Ain Zalah, 1939 | 5,200-6,500 | 15 | 28 | | | 31.0 |
| | | Bai Hassan, 1953 | 4,800-5,400 | 56 | 84 | | | 34.0 |
| | | Balad, 1983 | 6,000-7,000 | 4 | 8 | | | 25.0 |
| | | Butmah, 1953 | 3,900 | 1 | 17 | | | 31.0 |
| | | Buzurgan, 1970 | 12,000 | 20 | 22 | | | 24.0 |
| | | East Baghad, 1975 | 6,000-7,000 | 32 | 79 | | | 23.0 |
| | | Hamrin, 1973 | 2,000 | ... | 14 | | | 30.0 |
| | | Jebel Fauqui, 1974 | 10,000 | 20 | 23 | | | 25.5 |
| | | Jambur, 1954 | 5,500-12,500 | 27 | 50 | | | 38.0 |
| | | Kirkuk, 1927 | 2,800-4,200 | 71 | 289 | | | 36.0 |
| | | Luhais, 1961 | 8,200 | 12 | 21 | | | 33.0 |
| | | Naft Khaneh, 1909 | 3,500 | 7 | 11 | | | 42.5 |
| | | Nahr Umar, 1949 | 8,200 | 5 | 13 | | | 42.0 |
| | | Qaiyarah, 1929 | 650 | 33 | 50 | | | 16.0 |
| | | Rumaila North, 1958 | 10,300 | 303 | 443 | | | 33.0 |
| | | Rumaila South, 1953 | 10,200 | 133 | 208 | | | 34.0 |
| | | Suffayah, 1978 | 3,900 | 11 | 39 | | | 25.0 |
| | | West Tikrit, 1985 | 8,200 | 2 | 6 | | | 23.0 |
| | | Zubair, 1949 | 10,200 | 56 | 110 | | | 35.0 |
| *Prior to conflict in the Persian Gulf. | | **Total Iraq** | | ***920** | **1,511** | **2,080,000** | **22,430,413,000** | |
| **ISRAEL(•)** | LAPIDOTH | Heletz-Brur, 1955 | 5,200 | 4 | 18 | 249 | 17,010,100 | 29.2 |
| | | Kochav, 1962 | 5,500 | 6 | 13 | | | 27.9 |
| | OEIL | Ashdod, 1976 | 8,400 | 2 | 2 | | | 32.5 |
| | EMOG | Gurim, 1984 | 3,280 | ... | ... | | | 17.0 |
| | | **Total Israel** | | **12** | **33** | **249** | **17,010,100** | |
| **ITALY** | ELF | • Rospo Mare, 1975 | 4,600 | 19 | 20 | 27,873 | 34,658,319 | 12.2 |
| | | • Santa Maria a Mare, 1974 | 7,900 | 8 | 9 | 720 | 18,256,871 | 22.3 |
| | | • Sarago Mare, 1979 | 5,200 | 4 | 6 | 3,771 | [illegible]15,186 | 8.1 |
| | AGIP | Benevento, 1974 | 10,356 | 1 | 1 | 669 | 644,000 | 39.0 |
| | | Cammarata/Pozzillo, 1959 | 10,499 | 4 | 4 | 108 | 1,646,000 | 8.3 |
| | | Cavone, 1973 | 9,350 | 10 | 14 | 2,700 | 9,873,000 | 21.5 |
| | | Cortemaggiore, 1949 | 6,562 | 3 | 5 | 111 | 7,707,000 | 33.2 |
| | | Costamolina, 1963 | 12,796 | 1 | 1 | 92 | 34,000 | 17.8 |
| | | • Emilio, 1971 | 8,530 | 1 | 1 | 411 | 649,000 | 10.7 |
| | | Gaggiano, 1982 | 14,764 | 2 | 2 | 328 | 563,000 | 37.2 |
| | | Gela, 1956 | 10,827 | 63 | 85 | 8,162 | 121,618,000 | 10.0 |
| | | Gieurone, 1982 | 10,170 | 2 | 5 | 169 | 63,000 | 10.2 |
| | | Malossa, 1973 | 17,080 | 2 | 4 | 340 | 26,262,000 | 52.9 |
| | | Monte Alpi, 1988 | 11,483 | 1 | 2 | 23 | 108,000 | 37.2 |
| | | • Perla, 1976 | 7,874 | 3 | 4 | 53 | 1,956,000 | 13.3 |
| | | Pisticci-S. Cataldo, 1960 | 6,980 | 8 | 11 | 1,206 | 8,763,000 | 12.0 |
| | | Ponte-Dirillo, 1959 | 9,514 | 9 | 11 | 1,865 | 12,483,000 | 15.6 |
| | | • Prezioso, 1982 | 15,748 | 8 | 8 | 4,623 | 3,024,000 | 19.7 |
| | | Ragusa, 1953 | 4,593 | 37 | 39 | 4,044 | 131,032,000 | 19.3 |
| | | S. Maria Inbaro, 1963 | 7,545 | 3 | 3 | 319 | 480,000 | 15.9 |
| | | Torrente Tona, 1963 | 4,101 | 8 | 13 | 933 | 2,066,000 | 31.9 |
| | | V. Fortuna, 1984 | 18,044 | 5 | 12 | 11,818 | 9,614,000 | 46.3 |
| | SALM | Vega, 1980 | 8,500 | 20 | 24 | 13,200 | 24,930,178 | 16.0 |
| | | **Total Italy** | | **222** | **284** | **83,456** | **436,067,864** | |
| **IVORY COAST(•)** | SIOP | • Belier, 1975 | 6,500-7,000 | 13 | 18 | 2,000 | 50,224,071 | 34.5 |
| | PETROCI | • Espoir, 1980 | 6,500-11,000 | ... | ... | | | 32.3 |
| | | **Total Ivory Coast** | | **13** | **18** | **2,000** | **50,224,071** | |

|  |  |  |  | No. of wells |  | Production |  |  |
|---|---|---|---|---|---|---|---|---|
|  |  | Name of field, discovery date | Depth, ft | Producing | Total | 1990 average b/d | Cumulative to Dec. 31, 1990 bbl | °API gravity |
| **JAPAN** | JAPEX | • Aga-Oki, 1972 | 7,590 | 6 | 6 | 638 | 3,528,388 | 24.8 |
|  |  | Higashi-Niigata, 1965 | 4,600-9,200 | 20 | 32 | 664 | 8,099,844 | 53.9 |
|  |  | • Iwafune-Oki, 1984 | 5,050-6,660 | 1 | 1 | 559 | 10,244 | ... |
|  |  | Katakai, 1960 | 3,310-16,300 | 3 | 18 | 468 | 942,895 | 50.0 |
|  |  | Sarukawa, 1958 | 2,000-3,200 | 84 | 133 | 1,263 | 18,006,415 | 32.3 |
|  |  | Yoshii, 1968 | 8,000 | 10 | 24 | 592 | 9,327,742 | 61.8 |
|  |  | Yurihara, 1976 | 1,310-7,610 | 11 | 14 | 216 | 573,388 | 43.5 |
|  |  | Other | ... | 43 | 88 | 323 | 22,479,613 | ... |
|  | IDEMITSU OIL | • Agaoki-Kita, 1982 | 4,950 | 10 | 10 | 1,840 | 7,100,000 | 37.0 |
|  | TEIKOKU | Hagashi-Kashiwazaki, 1970 | 6,000-8,900 | 6 | 10 | 568 | 8,496,186 | 62.0 |
|  |  | Kubiki, 1959 | 1,100-6,400 | 73 | 129 | 684 | 12,074,587 | 29.7 |
|  |  | Minami-Aga, 1964 | 7,300-9,600 | 7 | 35 | 500 | 14,196,627 | 38.5 |
|  |  | Minami-Nagaoka, 1984 | 13,200-15,100 | 5 | 14 | 582 | 1,310,557 | 55.7 |
|  |  | Yabase, 1933 | 1,100-5,800 | 52 | 80 | 373 | 33,495,872 | 33.0 |
|  |  | Other | ... | 12 | 13 | 77 | 2,766,405 | ... |
|  |  | **Total Japan** |  | 343 | 607 | 9,347 | 142,406,953 |  |
| **JORDAN** | NRA | Hamzah, 1984 | 9,500 | 4 | 17 | 327 | 617,000 | 30.0 |
|  |  | **Total Jordan** |  | 4 | 17 | 327 | 617,000 |  |
| **KUWAIT(*)** | KOC | Burgan, 1938 | 4,800 | 210 | 393 | 1,079,000 | 24,113,888,000 | 30.8 |
|  |  | Ahmadi, 1952 | 4,800 | 11 | 84 |  |  | 31.7 |
|  |  | Magwa, 1951 | 4,800 | 71 | 113 |  |  | 33.0 |
|  |  | Raudhatain, 1955 | 8,800 | 41 | 53 |  |  | 34.4 |
|  |  | Bahra, 1956 | 8,500 | ... | 2 |  |  | ... |
|  |  | Sabriya, 1957 | 8,300 | 9 | 44 |  |  | 36.3 |
|  |  | Minagish, 1959 | 10,000 | 1 | 21 |  |  | 34.4 |
|  |  | Umm Gudair, 1962 | 9,000 | 20 | 33 |  |  | 26.9 |
| *Prior to the conflict in the Persian Gulf. |  | **Total Kuwait** |  | *363 | 743 | 1,079,000 | 24,113,888,000 |  |
| **LIBYA** | AGIP | Bouri, 1979 | 8,300 | 40 | 41 | 73,943 | 42,786,866 | 25.8 |
|  |  | Bu Attifel, 1968 | 14,000 | 34 | 37 | 170,051 | 946,867,160 | 40.7 |
|  |  | Rimal, 1965 | 11,000-14,000 | 4 | 6 | 4,806 | 9,519,537 | 33.2 |
|  |  | Kalib, 1969 | 12,300 | 1 | 1 | 255 | 504,430 | 36.3 |
|  | ELF(*) | El Meheiriga | 10,500 | 1 | 2 | 1,125,145 | 16,464,318,040 | 46.0 |
|  | LHOC(*) | Arshad, 1966 | 10,100 | 491 | 491 |  |  | 42.0 |
|  |  | Jebel, 1962 | 8,100 |  |  |  |  | 38.0 |
|  |  | Majid, 1968 | 9,000-9,800 |  |  |  |  | ... |
|  |  | Don Mansour Unit | 5,600 |  |  |  |  | ... |
|  |  | Nasser, 1959 | 5,500-7,800 |  |  |  |  | 38.0 |
|  |  | Lehib-Dor Marada Unit, 1965 | 9,500 |  |  |  |  | 50.0 |
|  |  | Raguba, 1961 | 5,400 |  |  |  |  | 43.0 |
|  |  | Beda, 1959 | 4,000 |  |  |  |  | 36.0 |
|  |  | Busiewn, 1972 | 6,000 |  |  |  |  | 40.0 |
|  |  | Dor, 1967 | 6,400 |  |  |  |  | 33.2 |
|  |  | Kotla, 1963 | 5,500 |  |  |  |  | 34.0 |
|  |  | Sahabi B & D, 1961 | 9,000-10,000 |  |  |  |  | 39.0 |
|  |  | Sarir, 1961 | 9,000 |  |  |  |  | 37.2 |
|  |  | Amal, 1959 | 9,900 |  |  |  |  | 37.5 |
|  |  | Ora, 1962 | 7,250 |  |  |  |  | 40.2 |
|  |  | Ghani, 1978 | 6,000 |  |  |  |  | 40.0 |
|  |  | Behi, 1958 | 3,600-3,750 |  |  |  |  | 43.4 |
|  |  | Belhedan, 1962 | 7,000 |  |  |  |  | 33.6 |
|  |  | Dahra, 1959 | 3,100-3,700 |  |  |  |  | 37.0-41.0 |
|  |  | Defa, 1960 | 5,400-5,900 |  |  |  |  | 35.6 |
|  |  | Gialo, 1961 | 2,200-6,300 |  |  |  |  | 35.7 |
|  |  | Hersh, 1978 | 7,400 |  |  |  |  | 34.8 |
|  |  | Khalifa, 1978 | 6,400-7,000 |  |  |  |  | 34.6 |
|  |  | Masrab, 1978 | 10,000 |  |  |  |  | 39.6 |
|  |  | Sameh, 1961 | 9,000 |  |  |  |  | 33.4 |
|  |  | Waha, 1960 | 6,000 |  |  |  |  | 36.0 |
|  |  | Zaggut, 1962 | 6,000 |  |  |  |  | 36.4 |
|  |  | Balat, 1963 | 5,100-5,400 |  |  |  |  | 32.2 |
|  |  | Ali, 1975 | 3,900 | 1 | 2 |  |  | 50.0 |
|  |  | Almas, 1975 | 4,000 | 5 | 8 |  |  | 49.5 |
|  |  | Intisar A, 1967 | 9,750 | 8 | 19 |  |  | 46.0 |
|  |  | Intisar B, 1974 | 9,800 | 2 | 2 |  |  | 50.0 |
|  |  | Intisar C, 1967 | 9,650 | 1 | 6 |  |  | 37.5 |
|  |  | Intisar D, 1967 | 9,400 | 19 | 27 |  |  | 39.0 |
|  |  | Intisar E, 1968 | 5,300-7,100 | 8 | 11 |  |  | 34.7 |
|  |  | Nafoora-Augila, 1966 | 2,200-10,000 | 13 | 55 |  |  | 35.5 |
|  |  | Aswad, 1978 | 6,250 | 8 | 8 |  |  | 46.0 |
|  |  | Sabah, 1977 | 5,500 | 36 | 38 |  |  | 42.0 |
|  |  | Zella, 1977 | 6,750 | 27 | 31 |  |  | 48.1 |
|  |  | Fidaa, 1979 | 7,000 | 9 | 9 |  |  | 41.7 |
|  |  | Hakim, 1978 | 6,700 | 3 | 3 |  |  | 48.5 |
|  |  | Other | 7,900-8,900 | 1 | 2 |  |  | 48.4 |
|  |  | **Total Libya** | – | 712 | 799 | 1,374,200 | 17,463,996,033 |  |

**WORLDWIDE PRODUCTION**

| | | Name of field, discovery date | Depth, ft | No. of wells<br>Producing | Total | Production<br>1980 average b/d | Cumulative to Dec. 31, 1980 bbl | °API gravity |
|---|---|---|---|---|---|---|---|---|
| **MALAYSIA** | ESSO MALAYSIA | ● Bekok, 1976 | 5,500 | 22 | 33 | 330,000 | 940,000,000 | 47.0 |
| | | ● Guntong, 1978 | 5,200 | 56 | 91 | | | 44.0 |
| | | ● Irong Barat, 1979 | 3,300 | 9 | 18 | | | 35.0 |
| | | ● Kepong, 1979 | 6,000 | ... | 11 | | | 47.0 |
| | | ● Palas, 1979 | 6,300 | 13 | 18 | | | 40.0 |
| | | ● Pulai, 1973 | 4,300 | 22 | 32 | | | 42.3 |
| | | ● Seligi, 1971 | 4,300 | 40 | 43 | | | 50.0 |
| | | ● Semangkok, 1980 | 3,700 | 31 | 41 | | | 42.5 |
| | | ● Tabu, 1978 | 5,600 | 15 | 24 | | | 44.0 |
| | | ● Tapis, 1975 | 6,700 | 41 | 80 | | | 45.0 |
| | | ● Tinggi, 1980 | 4,400 | 21 | 27 | | | 46.0 |
| | | ● Tiong, 1978 | 5,800 | 20 | 41 | | | 47.0 |
| | SABAH SHELL PETROLEUM (SSPC) | ● Barton, 1971 | 2,400 | 4 | 4 | 10,411 | 16,400,000 | 37.0 |
| | | ● Erb West, 1971 | 6,785 | 15 | 19 | 22,466 | 43,900,000 | 30.0 |
| | | ● Ketam, 1977 | 4,800 | 1 | 4 | 274 | 1,300,000 | 30.0 |
| | | ● Samarang, 1972 | 5,700 | 56 | 80 | 46,027 | 295,300,000 | 37.0 |
| | | ● South Furious, 1974 | 3,300 | 7 | 15 | 4,384 | 16,300,000 | 30.0 |
| | | ● St. Joseph, 1975 | 2,200 | 11 | 14 | 37,534 | 47,000,000 | 32.0 |
| | SARAWAK SHELL BERHAD (SSB) | ● Bayan, 1976 | 4,200 | 7 | 9 | 24,932 | 41,100,000 | 37.3 |
| | | ● D-18, 1981 | 4,000 | 5 | 5 | 2,466 | 4,900,000 | 39.9 |
| | | ● Temana, 1972 | 3,100 | 19 | 29 | 13,151 | 49,300,000 | 35.0 |
| | PETRONAS CARIGALI(e) | ● Tembungo, 1971 | 6,000 | 8 | 16 | 131,366 | 825,126,600 | 40.0 |
| | SARAWAK SHELL/PETRONAS CAG.(e) | ● Bakau | ... | ... | ... | | | ... |
| | | ● Baram | ... | ... | ... | | | ... |
| | | ● Baronia, 1967 | 7,900 | 19 | 40 | | | 42.0 |
| | | ● Betty, 1967 | 7,900 | 13 | 17 | | | 38.0 |
| | | ● Bokor, 1972 | 2,000 | 18 | 19 | | | 35.0 |
| | | ● Fairley Baram, 1973 | 8,655 | ... | 2 | | | 39.5 |
| | | ● Siwa, 1973 | 4,100 | 4 | 4 | | | 25.0 |
| | | ● Tukau, 1966 | 5,000 | 26 | 46 | | | 29.2 |
| | | ● West Lutong | ... | ... | ... | | | 39.5 |
| | | **Total Malaysia** | | **503** | **784** | **623,000** | **2,280,626,600** | |
| **MEXICO** | NORTH ZONE, FRONTERA NE | Misión, 1945 | 5,440 | | | 173 | | ... |
| | | Monterrey, 1950 | 6,510 | | | | | 42.4 |
| | | Tigrillo, 1971 | 3,342 | | | | | ... |
| | | Cañon | ... | | | | | ... |
| | | Comitas | ... | | | | | ... |
| | NORTH ZONE, ALTAMIRA | Arenque, 1970 | 11,362 | | | 25,254 | | 36.0 |
| | | Constituciones, 1956 | 6,350 | | | | | 17.0 |
| | | Ebano-Pánuco, 1901 | 1,450 | | | | | 12.0 |
| | | Tamaulipas | 4,200 | | | | | 19.0 |
| | NORTH ZONE, CERRO AZUL | Chicontepec, 1973 | 4,264 | | | 16,853 | | ... |
| | | ● Isla de Lobos, 1963 | 6,875 | | | | | 34.1 |
| | | ● Marsopa, 1974 | 10,198 | | | | | 40.0 |
| | | Naranjos-C. Azul, 1909 | 1,800 | | | | | 34.0 |
| | | Tres Hermanos, 1959 | 6,960 | | | | | 27.0 |
| | NORTH ZONE, POZA RICA | ● Atún, 1966 | 9,040 | | | 90,530 | | 37.0 |
| | | ● Bagre, 1973 | 10,919 | | | | | 33.0 |
| | | Escolín, 1942 | 7,216 | | | | | 28.3 |
| | | Hallazgo, 1955 | 10,170 | | | | | 28.7 |
| | | Jiliapa, 1958 | 7,380 | | | | | 36.6 |
| | | Mecatepec, 1941 | 7,544 | | | | | 29.8 |
| | | Miquetla, 1959 | 6,480 | | | | | 29.8 |
| | | Poza Rica, 1930 | 7,090 | | | | | 36.0 |
| | | Pres. Alemán, 1949 | 8,036 | | | | | 24.0 |
| | | Remolino, 1962 | 10,745 | | | | | 29.5 |
| | | San Andrés, 1956 | 10,410 | | | | | 29.0 |
| | NORTH ZONE, FAJA DE ORO | Acuatempa, 1955 | 4,085 | | | | | 21.0 |
| | | Muro, 1965 | 3,966 | | | | | 17.0 |
| | | Ordoñez, 1952 | 5,220 | | | | | 21.0 |
| | | Ocotepec, 1953 | 3,737 | | | | | 20.9 |
| | | Santa Agueda, 1953 | 4,790 | | | | | 16.0 |
| | NORTH ZONE, VERACRUZ | Matapionche, 1974 | 11,129 | | | 5,394 | | |
| | | Angostura | ... | | | | | 36.9 |
| | | Copite | ... | | | | | 14.0 |
| | | Other | ... | | | | | 32.3 |
| | SOUTH ZONE, NANCHITAL | Ixhuatlán Ote, 1965 | 1,960 | | | 61,519 | | 20.4 |
| | | Moloacán, 1962 | 500 | | | | | 22.0 |
| | | Santa Rosa, 1952 | 1,312 | | | | | 25.4 |
| | SOUTH ZONE, AGUA DULCE | Agata, 1966 | 3,830 | | | | | 34.6 |
| | | Bacal, 1978 | 3,500 | | | | | 35.0 |
| | | Blasillo, 1967 | 7,216 | | | | | 37.0 |
| | | Cinco Pres, 1960 | 6,862 | | | | | 32.0 |
| | | Concepcion, 1974 | 1,600 | | | | | 32.7 |
| | | Cuichapa, 1935 | 2,200 | | | | | 30.0 |
| | | El Plan, 1931 | 1,700 | | | | | 30.0 |
| | | El Burro, 1931 | 2,200 | | | | | 31.0 |

| | | Name of field, discovery date | Depth, ft | No. of wells | | Production | | °API gravity |
|---|---|---|---|---|---|---|---|---|
| | | | | Producing | Total | 1980 average b/d | Cumulative to Dec. 31, 1980 bbl | |
| | | Lacamango, 1973 | 1,700 | 4,740 | 4,740 | | 17,475,500,400 | 31.8 |
| | | Los Soldados, 1953 | 4,462 | | | | | 37.0 |
| | | La Venta, 1954 | 4,730 | | | | | 33.0 |
| | | Ogarrio, 1957 | 5,790 | | | | | 33.0 |
| | | Otates, 1965 | 7,469 | | | | | 32.0 |
| | | Rodador, 1971 | 11,398 | | | | | 32.0 |
| | | S. Magallanes, 1957 | 4,240 | | | | | 30.0 |
| | | San Ramon, 1967 | 9,515 | | | | | 28.0 |
| | | Tonala, 1928 | 1,770 | | | | | 32.0 |
| | SOUTH ZONE, REFORMA | Agave, 1977 | 13,460 | | | 205,360 | | 43.1 |
| | | Arroyo Zanapa, 1978 | 14,599 | | | | | 39.2 |
| | | Artesa, 1977 | 11,800 | | | | | 24.4 |
| | | Cacho López, 1977 | 14,250 | | | | | 29.0 |
| | | Cáctus, 1972 | 14,100 | | | | | 36.0 |
| | | Carmito, 1980 | 10,050 | | | | | 45.6 |
| | | Carrizo, 1962 | 3,500 | | | | | 23.3 |
| | | Comoapa, 1979 | 14,432 | | | | | 33.2 |
| | | Copano, 1977 | 11,880 | | | | | 47.3 |
| | | Chiapas, 1979 | 12,136 | | | | | 47.3 |
| | | Giraldas, 1977 | 15,225 | | | | | 46.0 |
| | | Iride, 1974 | 13,775 | | | | | 28.5 |
| | | Iris, 1979 | 14,432 | | | | | 38.8 |
| | | Muspac, 1982 | 9,676 | | | | | 58.5 |
| | | Mundo Nuevo, 1977 | 11,800 | | | | | 40.3 |
| | | Nispero, 1974 | 14,100 | | | | | 37.7 |
| | | Platanal, 1978 | 15,900 | | | | | 31.2 |
| | | Rio Nuevo, 1975 | 14,950 | | | | | 35.6 |
| | | Samaria (Cret), 1973 | 14,209 | | | | | 31.0 |
| | | Sitio Grande, 1972 | 13,786 | | | | | 35.0 |
| | | Sunuapa, 1978 | 12,867 | | | | | 31.8 |
| | | Tapijulapa, 1982 | 15,613 | | | | | 30.8 |
| | | Topen, 1978 | 11,172 | | | | | 39.6 |
| | | Artesa (Terc), 1964 | ... | | | | | 28.0 |
| | | Samaria (Terc), 1965 | 4,920 | | | | | 13.9 |
| | SOUTH ZONE, COMALCALCO | Ayapa, 1972 | 8,200 | | | 128,626 | | 27.2 |
| | | Castarrical, 1967 | 10,080 | | | | | 30.9 |
| | | Cunduacan, 1974 | 13,775 | | | | | 27.6 |
| | | El Golpe, 1963 | 3,500 | | | | | 28.5 |
| | | Mora, 1961 | ... | | | | | 36.1 |
| | | Oxiacaque | 11,150 | | | | | 27.9 |
| | | Santuario, 1966 | 9,617 | | | | | 37.0 |
| | | Tintal, 1966 | 5,904 | | | | | 23.0 |
| | | Tupilco, 1959 | 9,685 | | | | | 27.0 |
| | | Bellota, 1982 | 17,056 | | | | | 36.8 |
| | | Caparroso, 1982 | 18,368 | | | | | 33.2 |
| | SOUTH ZONE, CARDENAS | Cardenas, 1979 | 17,546 | | | 254,834 | | 38.0 |
| | | Edén, 1983 | 17,590 | | | | | 37.0 |
| | | Fenix, 1979 | 17,876 | | | | | 40.0 |
| | | Jolote, 1983 | 18,119 | | | | | 36.7 |
| | | Jujo, 1980 | 17,546 | | | | | 34.0 |
| | | Paredón, 1978 | 15,690 | | | | | 38.8 |
| | | Tecominoacan, 1983 | 19,519 | | | | | 33.2 |
| | SOUTH ZONE, OCOSINGO | Fortuna Nacional | ... | | | 174 | | 34.0 |
| | | Jose Colomo | ... | | | | | 34.0 |
| | | Vernet | ... | | | | | 34.0 |
| | MARINE ZONE, CD. DEL CARMEN | • Cantarell, 1976 | 8,528 | | | 1,219,950 | | 21.3 |
| | | • Ku, 1979 | 10,000 | | | | | 22.0 |
| | MARINE ZONE, DOS BOCAS | • Abkatun, 1978 | 11,800 | | | 573,726 | | 27.6 |
| | | • Pol, 1979 | 12,800 | | | | | 33.0 |
| | | • Chuc, 1982 | 13,100 | | | | | 35.0 |
| | | • Ixtoc, 1974 | ... | | | | | 29.9 |
| | | **Total Mexico** | | **4,740** | **4,740** | **2,542,200** | **17,475,500,400** | |
| **MOROCCO** | | Essaouira, 1976 | 10,500 | 6 | 6 | 399 | 810,757 | 40.0 |
| | | Rharb, 1951 | 4,590 | 6 | 6 | 586 | 4,214,173 | — |
| | | Haricha, 1967 | 3,000 | — | — | ... | 12,430,255 | — |
| | | Sidi Rhalem, 1962 | 6,266-7,186 | — | — | ... | | — |
| | | Other | | — | — | ... | | — |
| | | **Total Morocco** | | **12** | **12** | **985** | **17,455,185** | |
| **MYANMAR(•)** | MYANMA | Chauk-Lanywa, 1902 | 1,500-4,000 | 430 | 450 | 13,080 | 904,300,000 | 36.0 |
| | | Mann, 1970 | 1,800-7,000 | | | | | 37.5 |
| | | Myanaung, 1964 | 2,000-4,000 | | | | | 40.5 |
| | | Prome, 1965 | 850-5,000 | | | | | 36.0 |
| | | Yenangyaung, 1902 | 100-6,700 | | | | | 36.0 |
| | | **Total Myanmar** | | **430** | **450** | **13,080** | **904,300,000** | |

WORLDWIDE PRODUCTION

| | | Name of field, discovery date | Depth, ft | No. of wells | | Production | | °API gravity |
|---|---|---|---|---|---|---|---|---|
| | | | | Producing | Total | 1980 average b/d | Cumulative to Dec. 31, 1980 bbl | |
| **NETHERLANDS** | UNOCAL | ● Haven, 1980 | 5,300 | 2 | 2 | 4,046 | 1,644,075 | 26.5 |
| | | ● Helder, 1980 | 4,800 | 12 | 15 | 4,468 | 23,266,028 | 21.6 |
| | | ● Helm, 1979 | 4,400 | 7 | 9 | 1,593 | 8,827,041 | 17.9 |
| | | ● Hoorn, 1981 | 5,000 | 7 | 8 | 3,492 | 22,214,298 | 25.8 |
| | NAM | Berkel, 1954 | ... | 17 | 17 | 3,611 | 8,038,000 | 32.1 |
| | | DeLier, 1955 | 5,200 | 22 | 33 | 605 | 17,341,000 | 33.2 |
| | | IJsselmonde, 1956 | ... | 59 | 86 | 3,838 | 93,819,000 | 26.8 |
| | | Meerkapelle, 1955 | ... | ... | ... | 2,049 | 748,000 | 28.6 |
| | | Pernis West, 1967 | ... | ... | ... | ... | 82,000 | 28.2 |
| | | Pijnacker, 1955 | ... | 4 | 5 | 307 | 6,460,000 | 36.3 |
| | | Rotterdam, 1984 | ... | 2 | 2 | 4,126 | 5,221,000 | 30.5 |
| | | Schoonebeek, 1944 | 2,500 | ... | 495 | 7,737 | 241,151,000 | 12.3 |
| | | Werkendam, 1956 | ... | ... | ... | 16 | 258,000 | 33.0 |
| | | Zoetermeer, 1957 | 3,200 | 30 | 30 | 764 | 10,611,000 | 16.5 |
| | CONOCO | ● Kotter, 1980 | 6,500 | 7 | 11 | 20,320 | 44,632,137 | 33.0 |
| | | ● Logger, 1982 | 6,500 | 5 | 9 | 8,946 | 19,276,989 | 33.5 |
| | AMOCO | ● Rijn, 1982 | 6,600 | 13 | 28 | 4,320 | 18,774,817 | 36.0 |
| | | Total Netherlands | | 187 | 750 | 70,347 | 522,366,386 | |
| **NEUTRAL ZONE** | AOC | ● Hout, 1969 | 4,900-6,800 | 21 | 34 | 3,900 | 66,130,000 | 33.0 |
| | | ● Khafji, 1961 | 4,400-7,300 | 135 | 166 | 229,560 | 2,849,320,090 | 28.2 |
| | TEXACO & KOC[a] | S. Fuwaris, 1963 | 6,300 | 5 | 9 | | | 25.0 |
| | | S. Umm Gudair, 1966 | 8,900 | 16 | 17 | 78,540 | 1,812,607,100 | 24.3 |
| | | Wafra, 1953 | 1,100-7,000 | 322 | 427 | | | 18.9-23.5 |
| | | Total Neutral Zone | | 499 | 662 | 312,000 | 4,728,057,100 | |
| **NEW[a] ZEALAND** | SHELL-BP-TODD | ● Kapuni, 1959 | 11,700 | 11 | 14 | — | | 54.0 |
| | | ● Maui, 1969 | 11,000 | 14 | 14 | | | 51.0 |
| | PCNZ | Ahuroa, 1987 | 8,688 | ... | 1 | | | 46.1 |
| | | Kaimiro, 1982 | 11,900 | 2 | 2 | 38,000 | 110,726,300 | 42.0 |
| | | McKee, 1980 | 7,846-8,251 | 19 | 22 | | | 38.5 |
| | | Tariki, 1986 | 9,065 | ... | 1 | | | 52.7 |
| | | Waihapa, 1988 | 10,125-10,643 | 5 | 6 | | | 36.6 |
| | | Total New Zealand | | 51 | 60 | 38,000 | 110,726,300 | |
| **NIGERIA** | AGIP | ● Abgara, 1981 | 7,500-12,000 | 16 | 16 | 25,774 | 13,547,028 | 36.2 |
| | | Agwe, 1975 | 10,800 | 1 | 2 | 408 | 2,307,927 | 44.0 |
| | | Akri, 1967 | 9,600-10,600 | 6 | 11 | 8,814 | 64,407,651 | 40.8 |
| | | Akri W., 1972 | 9,900-10,200 | ... | 2 | ... | 482,258 | ... |
| | | Ashaka, 1968 | 9,700-12,000 | 1 | 1 | 1,011 | 3,344,886 | 37.4 |
| | | Azuzuama, 1975 | 8,700-14,800 | 2 | 2 | 1,268 | 463,258 | 34.1 |
| | | ● Beniboye, 1978 | 9,000-10,000 | 9 | 9 | 6,433 | 16,658,435 | 28.6 |
| | | Beniku, 1974 | 12,000 | 1 | 2 | 128 | 3,407,816 | 14.8 |
| | | Clough Creek, 1976 | 10,000-12,400 | 9 | 9 | 9,318 | 28,799,764 | 25.5 |
| | | Ebegoro, 1975 | 11,500-12,000 | 6 | 9 | 6,197 | 66,771,341 | 37.1 |
| | | Ebocha, 1965 | 8,000-10,900 | 10 | 18 | 8,836 | 116,862,582 | 36.3 |
| | | Idu, 1973 | 7,750-10,700 | ... | 10 | ... | 23,862,581 | ... |
| | | Kwale, 1967 | 10,000-11,500 | 6 | 8 | 8,370 | 13,274,523 | 37.1 |
| | | Mbede, 1966 | 7,300-9,400 | 10 | 16 | 12,589 | 172,997,990 | 43.1 |
| | | Obama, 1973 | 11,600-14,300 | 6 | 8 | 14,877 | 108,476,448 | 30.7 |
| | | Obiafu, 1967 | 9,300-12,200 | 16 | 20 | 19,249 | 98,996,243 | 41.8 |
| | | Obrikom, 1967 | 8,000-10,000 | 8 | 14 | 6,961 | 59,765,580 | 43.4 |
| | | Odugri, 1972 | 12,500 | 1 | 2 | 1,710 | 10,946,737 | 45.9 |
| | | Ogbogene, 1972 | 10,000 | ... | 2 | ... | 3,302,763 | ... |
| | | Ogbogene W., 1982 | 13,000 | ... | 1 | ... | 353,136 | ... |
| | | Okpai, 1966 | 10,000-12,000 | 8 | 8 | 4,987 | 22,272,119 | 42.8 |
| | | Omoku W., 1974 | 11,500 | 1 | 1 | 945 | 5,227,164 | 40.0 |
| | | Oshi, 1972 | 9,600-11,300 | 10 | 11 | 13,137 | 75,860,066 | 35.2 |
| | | Taylor Creek, 1965 | 8,300-10,400 | 1 | 1 | 3,197 | 1,692,976 | 37.3 |
| | | Tebidaba, 1972 | 10,300-11,300 | 7 | 10 | 15,901 | 130,095,927 | 30.4 |
| | | Umuoru, 1977 | 14,100 | 2 | 4 | 2,356 | 7,053,937 | 40.3 |
| | ELF | Aghigo, 1972 | 7,300 | 18 | 21 | 6,674 | 25,900,000 | 24.8 |
| | | Erema, 1972 | 11,211 | 3 | 5 | 6,240 | 13,200,000 | 24.6 |
| | | Obagi, 1964 | 8,377 | 56 | 74 | 56,384 | 386,800,000 | 24.6 |
| | | Obodo-Jatumi, 1966 | ... | 16 | 17 | 16,471 | 75,000,000 | 24.8 |
| | | Okpoko, 1967 | 6,745 | 16 | 17 | 6,750 | 34,600,000 | 24.8 |
| | | Upomami, 1965 | 8,256 | 11 | 14 | 4,604 | 18,400,000 | 24.8 |
| | GULF NIGERIA | Abiteye, 1970 | 5,750-9,400 | 12 | 18 | 6,788 | 68,620,694 | 39.7 |
| | | ● Delta, 1965 | 5,800-8,500 | 22 | 27 | 18,348 | 163,449,519 | 37.3 |
| | | ● Delta South, 1965 | 7,100-10,179 | 20 | 30 | 33,748 | 294,165,950 | 38.4 |
| | | ● Isan, 1970 | 5,900-9,000 | 8 | 11 | 1,946 | 44,227,300 | 40.4 |
| | | Jisike, 1975 | 6,300-7,600 | 3 | 5 | 1,041 | 7,298,105 | 41.1 |
| | | Makaraba, 1973 | 7,100-12,006 | 23 | 28 | 24,294 | 109,307,897 | 27.7 |
| | | ● Malu, 1969 | 4,800-6,300 | 13 | 18 | 15,585 | 114,239,427 | 40.4 |
| | | ● Meren, 1965 | 8,570-12,030 | 4 | 5 | 6,891 | 26,261,982 | 38.1 |
| | | ● Meji, 1965 | 5,200-10,900 | 26 | 22 | 18,317 | 164,923,786 | 31.9 |

WORLDWIDE PRODUCTION

| | Name of field, discovery date | Depth, ft | No. of wells Producing | No. of wells Total | Production 1990 average b/d | Production Cumulative to Dec. 31, 1990 bbl | °API gravity |
|---|---|---|---|---|---|---|---|
| | • Meren, 1965 | 5,000-7,500 | 37 | 58 | 58,427 | 536,009,957 | 31.9 |
| | • Mina, 1965 | ... | 3 | 3 | 4,730 | 3,975,460 | 40.3 |
| | • Okan, 1964 | 5,500-9,245 | 55 | 70 | 42,108 | 471,062,427 | 38.1 |
| | • Parabe/Eko, 1968 | 4,500-8,200 | 17 | 28 | 10,115 | 110,709,677 | 40.4 |
| | Robertkiri, 1964 | 11,484-13,190 | 11 | 13 | 20,878 | 27,301,921 | 40.2 |
| | • Tapa, 1978 | 8,150-10,842 | 8 | 10 | 9,840 | 34,846,887 | 39.5 |
| | Utonena, 1971 | 7,400-9,165 | 3 | 5 | 629 | 8,599,272 | 20.4 |
| | • W. Isan, 1971 | 7,825-10,229 | 5 | 9 | 2,389 | 36,136,036 | 40.4 |
| | Yorla South, 1974 | 11,369-12,635 | ... | 2 | ... | 822,618 | 41.0 |
| TEXACO-CHEVRON-NNPC | • Funiwa, 1978 | 5,000-7,000 | 20 | 25 | 19,386 | 57,447,072 | 35.5 |
| | • Middleton, 1972 | 5,000-7,000 | 3 | 7 | 2,137 | 17,407,040 | 36.3 |
| | • North Apoi, 1973 | 4,000-8,100 | 25 | 28 | 34,706 | 189,057,507 | 35.5 |
| | • Pennington, 1965 | 5,000-10,100 | 2 | 9 | 2,348 | 28,733,949 | 38.5 |
| | • Sengana, 1987 | 11,400-12,600 | ... | 2 | ... | 666,102 | 46.7 |
| MOBIL | • Adua, 1967 | 6,970 | 7 | 11 | 10,664 | 55,007,899 | 34.8 |
| | • Asabo, 1966 | 5,600 | 9 | 27 | 16,492 | 173,832,194 | 34.6 |
| | • Asabo "D", 1979 | 7,621 | 1 | 2 | 1,199 | 3,186,472 | 34.6 |
| | • Ata, 1964 | 8,823 | ... | 5 | ... | 433 | ... |
| | Edop, 1988 | 9,215 | 1 | 9 | 38,905 | 33,368,719 | 37.4 |
| | • Ekpe, 1966 | 8,200 | 10 | 22 | 14,222 | 198,798,729 | 34.9 |
| | • Ekpe-WW, 1977 | 6,810 | 2 | 6 | 6,036 | 40,310,161 | 31.9 |
| | • Eku, 1966 | 5,420 | 3 | 14 | 2,487 | 18,375,442 | 30.4 |
| | • Enang, 1968 | 6,600 | 18 | 38 | 17,261 | 144,339,212 | 37.4 |
| | • Etim, 1968 | 6,200 | 7 | 18 | 17,972 | 125,688,898 | 37.1 |
| | • Idoho, 1966 | 9,020 | 3 | 7 | 826 | 29,559,880 | 30.5 |
| | • Inim, 1966 | 5,850 | 7 | 14 | 1[illegible],432 | 154,868,705 | 37.5 |
| | • Isobo, 1968 | 7,345 | 3 | 7 | [illegible]4,841 | 14,358,750 | 30.4 |
| | • Iyak S.E., 1979 | 7,441 | 6 | 7 | 18,077 | 54,999,641 | 38.6 |
| | • Mfem, 1968 | 5,200 | 2 | 5 | 4,876 | 26,886,881 | 36.1 |
| | • Ubit, 1968 | 5,400 | 30 | 55 | 39,586 | 210,098,065 | 36.1 |
| | • Unam, 1967 | 5,180 | 7 | 15 | 10,762 | 52,159,220 | 33.3 |
| | • Usari, 1965 | 8,431 | ... | 4 | ... | 6,885 | ... |
| | • Utue, 1966 | 5,700 | 5 | 14 | 10,901 | 77,619,051 | 38.6 |
| PAN OCEAN | Ogharefe, 1973 | 9,900 | 7 | 18 | 1,158 | 29,669,006 | 46.6 |
| DUBRIL | Gilli-Gilli, 1967 | 9,357 | 3 | 7 | 906 | 1,137,667 | 47.1 |
| SHELL | Adibawa, 1966 | 11,950 | 11 | 27 | 12,052 | 86,987,584 | 21.4 |
| | Adibawa N.E., 1972 | 10,663 | 3 | 4 | 3,968 | 18,574,667 | 25.3 |
| | Afam, 1956 | 6,000 | 8 | 22 | 2,287 | 61,356,325 | 45.8 |
| | Afam Umu, 1957 | 10,024 | ... | 4 | ... | 2,378,685 | ... |
| | Afisere, 1966 | 8,500 | 29 | 35 | 11,844 | 125,204,182 | 19.3 |
| | Afremo, 1972 | 9,263 | 10 | 15 | 15,908 | 18,077,037 | 36.8 |
| | Agbada, 1960 | 10,000 | 29 | 53 | 19,6[illegible] | 196,223,121 | 23.9 |
| | Ahia, 1965 | 11,561 | 5 | 13 | 4,099 | 88,370,285 | 38.2 |
| | Ajokpori, 1967 | 11,139 | 1 | 5 | 527 | 5,848,952 | 39.3 |
| | Ajuju, 1970 | 13,324 | 1 | 5 | 971 | 10,304,503 | 34.7 |
| | Akaso, 1979 | 13,122 | 2 | 3 | 1,432 | 4,293,092 | 37.1 |
| | Akpor, 1965 | 10,149 | ... | 3 | ... | 1,833,108 | ... |
| | Akuba, 1967 | 10,434 | 1 | 1 | 254 | 4,486,154 | 22.7 |
| | Alakiri, 1959 | 10,169 | 12 | 26 | 7,430 | 70,945,576 | 44.5 |
| | Amukpe, 1970 | 11,459 | 2 | 3 | 1,198 | 13,591,666 | 41.7 |
| | Apara, 1960 | 9,000 | 3 | 10 | 3,799 | 29,300,026 | 38.4 |
| | Assa, 1961 | 9,738 | 2 | 4 | 1,060 | 5,949,721 | 20.6 |
| | Bodo East, 1962 | 9,700 | 9 | 12 | 4,216 | 83,991,568 | 27.1 |
| | Batan, 1968 | 11,000 | 9 | 10 | 7,777 | 60,320,288 | 21.7 |
| | Benisede, 1973 | 8,941 | 15 | 22 | 34,325 | 127,045,999 | 21.9 |
| | Bomu, 1958 | 7,000 | 6 | 49 | 6,146 | 359,457,322 | 37.3 |
| | Bonny, 1959 | 12,254 | 7 | 23 | 4,303 | 93,146,273 | 32.6 |
| | Buguma Creek, 1960 | 12,496 | 4 | 10 | 2,184 | 14,109,744 | 37.6 |
| | Cawthorne Chan, 1963 | 11,000 | 21 | 40 | 47,581 | 314,445,240 | 36.9 |
| | Diebu Creek, 1966 | 13,119 | 7 | 15 | 9,753 | 112,470,475 | 40.3 |
| | Ebubu, 1958 | 9,411 | 3 | 10 | 208 | 18,883,643 | 21.2 |
| | Egwa, 1967 | 9,350 | 18 | 29 | 16,944 | 146,784,895 | 34.1 |
| | Egbema, 1960 | 8,731 | 6 | 8 | 3,120 | 56,520,126 | 33.1 |
| | Egbema W., 1965 | 9,096 | 6 | 19 | 5,146 | 83,710,410 | 41.2 |
| | Ekulama, 1958 | 10,463 | 21 | 33 | 44,882 | 231,433,712 | 31.6 |
| | Elelenwa, 1960 | 11,000 | 6 | 18 | 3,716 | 36,119,812 | 35.8 |
| | Enwhe, 1965 | 10,170 | ... | 6 | ... | 2,611,679 | ... |
| | Etelebou, 1971 | 12,000 | 8 | 11 | 14,529 | 132,206,501 | 31.3 |
| | Eriemu, 1961 | 12,500 | 13 | 18 | 5,372 | 47,667,877 | 20.6 |
| | Escravos Beach, 1969 | 8,176 | 9 | 14 | 12,344 | 66,420,461 | 31.2 |
| | Evwreni, 1967 | 10,900 | 7 | 11 | 4,018 | 39,342,474 | 25.6 |
| | Forcados Yorki, 1968 | 10,869 | 56 | 124 | 53,582 | 590,642,984 | 24.4 |
| | Ibigwe, 1965 | ... | 3 | ... | 437,017 | ... | |
| | Imo River, 1959 | 7,900 | 37 | 57 | 47,017 | 496,674,807 | 30.3 |
| | Isimiri, 1964 | 8,450 | 1 | 8 | 391 | 36,370,370 | 29.3 |
| | Isoko, 1960 | 12,479 | 4 | 6 | 2,368 | 7,099,065 | 29.8 |
| | Jones Creek, 1967 | 8,000 | 29 | 36 | 37,541 | 423,977,565 | 29.7 |
| | Kalaekule, 1972 | 9,236 | 5 | 12 | 13,325 | 13,796,014 | 40.5 |
| | Kolo Creek, 1971 | 12,000 | 17 | 36 | 20,691 | 144,265,152 | 39.1 |
| | Kokori, 1961 | 8,900 | 25 | 32 | 19,387 | 322,186,253 | 38.9 |
| | Korokoro, 1969 | 10,222 | 6 | 9 | 3,391 | 85,541,415 | 35.8 |

# PRODUCTION

WORLDWIDE PRODUCTION

| | | | | No. of wells | | Production | | |
|---|---|---|---|---|---|---|---|---|
| | | Name of field, discovery date | Depth, ft | Producing | Total | 1990 average b/d | Cumulative to Dec. 31, 1990 bbl | °API gravity |
| | | Krakama, 1958 | 9,890 | 3 | 13 | 1,982 | 18,773,262 | 22.9 |
| | | Nembe Creek, 1973 | 12,213 | 39 | 49 | 96,778 | 285,191,169 | 31.0 |
| | | Nkali, 1963 | 12,000 | 4 | 12 | 3,610 | 31,860,205 | 39.2 |
| | | Nun-River, 1960 | 14,200 | 4 | 12 | 2,244 | 33,569,371 | 32.7 |
| | | Oben, 1972 | 12,036 | 17 | 28 | 16,533 | 134,469,258 | 37.6 |
| | | Obeakpu, 1975 | 8,274 | 2 | 5 | 2,983 | 19,318,618 | 26.3 |
| | | Obele, 1964 | 10,040 | ... | 5 | ... | 4,721,597 | ... |
| | | Obigbo | ... | ... | ... | ... | 396,727 | ... |
| | | Obigbo North, 1963 | 8,250 | 28 | 47 | 12,142 | 183,246,416 | 23.16 |
| | | Odeama Creek, 1981 | 12,897 | 5 | 6 | 21,632 | 35,066,963 | 35.5 |
| | | Odidi, 1967 | 10,980 | 34 | 44 | 46,405 | 209,265,369 | 36.2 |
| | | Ogini, 1964 | 5,860 | 8 | 25 | 3,977 | 24,84[illegible] | 18.2 |
| | | Oguta, 1965 | 10,300 | 13 | 28 | 10,622 | 136,39[illegible] | 43.2 |
| | | Olomoro, 1963 | 8,500 | 20 | 33 | 16,609 | 292,362,[illegible] | 21.5 |
| | | Onne, 1965 | 10,384 | 3 | 3 | 928 | 10,146,086 | 35.3 |
| | | Opuama, 1972 | 9,214 | 2 | 7 | 2,498 | 27,407,327 | 43.7 |
| | | Opobo South, 1974 | 9,849 | 3 | 10 | 4,092 | 21,762,134 | 43.7 |
| | | Opukushi, 1962 | 7,823 | 12 | 18 | 25,222 | 133,578,606 | 28.3 |
| | | Opukushi North, 1977 | 11,100 | 1 | 4 | 69 | 2,823,783 | 35.6 |
| | | Oloibiri, 1956 | 10,367 | ... | 18 | ... | 20,061,673 | ... |
| | | Oroni, 1964 | 12,000 | 6 | 8 | 2,495 | 27,623,535 | 22.6 |
| | | Orubiri, 1971 | 9,700 | 1 | 11 | 3,586 | 19,429,768 | 38.2 |
| | | Osioka, 1967 | 11,721 | 2 | 4 | 869 | 7,820,325 | 26.2 |
| | | Otamini, 1973 | 9,440 | 3 | 6 | 1,246 | 15,021,319 | 21.0 |
| | | Otumara, 1969 | 8,176 | 26 | 32 | 46,204 | 188,341,053 | 24.9 |
| | | Oweh, 1964 | 12,300 | 9 | 11 | 5,944 | 98,666,011 | 25.8 |
| | | Oza | ... | ... | ... | ... | 1,006,373 | ... |
| | | Rapele, 1965 | 11,627 | 1 | 6 | 484 | 23,188,706 | 44.0 |
| | | Rumuekpe, 1961 | 11,016 | 2 | 4 | 1,978 | 2,551,316 | 29.3 |
| | | Saghara, 1970 | 8,590 | 5 | 8 | 7,152 | 37,421,364 | 31.8 |
| | | Sapele, 1969 | 12,788 | 6 | 23 | 10,725 | 122,119,031 | 42.9 |
| | | Soku, 1958 | 11,500 | 16 | 25 | 9,563 | 118,849,660 | 27.7 |
| | | Tai, 1965 | 10,367 | 2 | 3 | 799 | 5,179,269 | 38.3 |
| | | Ubie, 1961 | 14,380 | 5 | 10 | 5,078 | 34,889,280 | 27.6 |
| | | Ughada, 1966 | 8,618 | 1 | 2 | 80 | 1,094,622 | 37.7 |
| | | Ughelli East, 1959 | 11,800 | 8 | 14 | 2,803 | 91,534,764 | 38.9 |
| | | Ughelli West, 1960 | 8,800 | 9 | 14 | 7,280 | 37,854,301 | 20.5 |
| | | Umuchem, 1959 | 8,250 | 8 | 23 | 4,510 | 151,464,846 | 37.2 |
| | | Utapate South, 1974 | 10,497 | 8 | 12 | 9,005 | 42,591,450 | 38.5 |
| | | Utorogu, 1964 | 9,000 | 17 | 30 | 8,454 | 136,284,367 | 26.8 |
| | | Uzere East, 1960 | 8,500 | 10 | 15 | 6,119 | 92,598,622 | 28.6 |
| | | Uzere West, 1963 | 8,500 | 11 | 11 | 5,803 | 103,685,793 | 25.4 |
| | | Warri River, 1961 | 12,264 | 2 | 5 | 1,234 | 15,816,865 | 29.8 |
| | | Yorla, 1970 | 11,917 | 10 | 16 | 6,629 | 64,229,584 | 39.2 |
| | | Yorla South, 1979 | 12,190 | ... | 2 | ... | 822,674 | ... |
| | ASHLAND | ● Adanga, 1980 | 14,098 | 7 | 19 | 11,376 | 24,560,874 | 32.1 |
| | | ● Akam, 1980 | 6,700 | 5 | 13 | 5,735 | 21,644,440 | 35.6 |
| | | ● Bogi, 1989 | 8,256 | 2 | 4 | 2,002 | 1,294,064 | 23.2 |
| | | ● Ebughu, 1984 | 7,250 | 3 | 4 | 906 | 911,781 | 28.0 |
| | | ● Izombe, 1974 | 9,500 | 8 | 32 | 10,196 | 57,595,735 | 37.8 |
| | | ● Mimbo, 1984 | 7,973 | 2 | 5 | 5,586 | 2,593,080 | 30.7 |
| | | Ossu, 1974 | 8,905 | 7 | 9 | 843 | 5,570,639 | 40.7 |
| | | ● Ukpam, 1989 | 7,425 | 1 | 2 | 1,695 | 1,564,018 | 40.6 |
| | TENNECO | Abura, 1979 | 13,471 | 2 | 5 | 1,875 | 17,932,465 | 44.7 |
| | | **Total Nigeria** | | **1,574** | **2,754** | **1,810,913** | **13,708,230,630** | |
| **NORWAY** | AMOCO | ● Hod, 1974 | 8,860 | 5 | 5 | 27,469 | 10,817,021 | 34.0 |
| | | ● Valhall, 1975 | 8,200 | 23 | 26 | 64,972 | 178,725,234 | 35.0 |
| | BP | ● Gyda, 1981 | 13,123 | 7 | 11 | 25,786 | 9,415,770 | 48.0 |
| | | ● Ula, 1976 | 11,800 | 8 | 14 | 94,915 | 132,490,825 | 44.6 |
| | CONOCO | ● Murchison*, 1975 | 9,900 | 21 | 34 | 8,114 | 63,656,330 | 38.0 |
| | NORSK HYDRO | ● Oseberg, 1979 | 7,500 | 11 | 15 | 300,000 | 198,000,000 | 34.0 |
| | PHILLIPS | ● Albuskjell, 1972 | 10,400 | 7 | 19 | 3,499 | 43,439,601 | 45.0 |
| | | ● Cod, 1968 | 9,500 | 6 | 8 | 600 | 15,951,706 | 55.0 |
| | | ● Edda, 1972 | 10,480-10,600 | 7 | 7 | 4,099 | 24,218,952 | 41.5 |
| | | ● Ekofisk, 1968 | 10,000 | 40 | 50 | 154,397 | 987,763,127 | 41.1 |
| | | ● Eldfisk, 1970 | 9,350-10,000 | 37 | 39 | 59,600 | 283,921,186 | 41.1 |
| | | ● Tor, 1970 | 10,000 | 12 | 13 | 7,200 | 113,065,189 | 38.0 |
| | | ● West Ekofisk, 1970 | 10,300 | 7 | 13 | 1,900 | 72,244,461 | 43.9 |
| | STATOIL | ● Gullfaks, 1978 | 9,500-9,700 | 39 | 54 | 255,556 | 270,595,800 | 29.3 |
| | | ● Statfjord, 1974 | 9,500 | 68 | 100 | 574,073 | 1,979,818,152 | 38.2 |
| | | ● Tommeliten, 1976 | 10,400 | 6 | 6 | 11,906 | 10,573,277 | 47.0 |
| | | ● Veslefrikk, 1981 | 10,100 | 8 | 11 | 49,518 | 18,038,588 | ... |
| | | **Total Norway** | | **308** | **425** | **1,643,806** | **4,412,735,219** | |
| **OMAN** | PDO | Al Burj, 1987 | 6,890 | 6 | 7 | 8,219 | 3,000,000 | 28.0 |
| | | Al Ghubar, 1976 | 1,916 | 3 | 6 | 8,219 | 10,000,000 | 29.0 |
| | | Al Huwaisah, 1969 | 5,320 | 43 | 47 | 16,438 | 183,000,000 | 39.0 |

*Norway share (22.2%) of total production.

| | | | | No. of wells | | Production | | |
|---|---|---|---|---|---|---|---|---|
| | | Name of field, discovery date | Depth, ft | Producing | Total | 1990 average b/d | Cumulative to Dec. 31, 1990 bbl | °API gravity |
| | | Alam, 1987 | ... | ... | ... | 2,740 | 1,000,000 | 33.0 |
| | | Amal, 1977 | ... | 34 | 30 | 8,219 | 14,000,000 | 19.0 |
| | | Amal S, 1982 | ... | | | 2,740 | 6,000,000 | 30.0 |
| | | Anzauz, 1974 | 7,098 | 4 | 4 | 5,479 | 10,000,000 | 46.5 |
| | | Bahja, 1984 | 5,697 | 10 | 12 | 13,699 | 18,000,000 | 47.2 |
| | | Barik, 1978 | 8,856 | 3 | 3 | 2,740 | 4,000,000 | 47.4 |
| | | Fahud, 1963 | 2,499 | 153 | 235 | 57,534 | 815,000,000 | 32.0 |
| | | Fahud West, 1965 | ... | ... | ... | 2,740 | 1,000,000 | 34.0 |
| | | Ghaba North, 1972 | 2,227 | 14 | 25 | 2,740 | 56,000,000 | 33.5 |
| | | Habur, 1975 | 5,800 | 1 | 2 | 13,699 | 5,000,000 | 15.0 |
| | | Hasirah, 1984 | 8,706 | 10 | 12 | 8,219 | 10,000,000 | 48.8 |
| | | Ihsan, 1984 | 5,578 | 5 | 6 | 2,740 | 2,000,000 | 23.5 |
| | | Jalmud, 1979 | 4,236 | 3 | 3 | 2,740 | 1,000,000 | 24.0 |
| | | Jawdah, 1984 | 3,570 | 6 | 7 | 2,740 | 3,000,000 | 29.5 |
| | | Karim W., 1982 | 3,546 | 26 | 27 | 13,699 | 24,000,000 | 23.0 |
| | | Kaukab, 1983 | 8,282 | 1 | 1 | 2,740 | 2,000,000 | 31.0 |
| | | Lekhwair, 1974 | 4,352 | 47 | 63 | 24,656 | 84,000,000 | 37.5 |
| | | Marmul, 1977 | 5,087 | 169 | 185 | 32,877 | 149,000,000 | 21.5 |
| | | Natih, 1963 | 4,788 | 36 | 68 | 24,658 | 369,000,000 | 33.4 |
| | | Nimr, 1980 | 3,296 | 117 | 119 | 41,096 | 53,000,000 | 21.0 |
| | | Qaharir, 1978 | 4,536 | 27 | 32 | 8,219 | 29,000,000 | 30.4 |
| | | Qarat Al Milh, 1973 | 4,936 | ... | ... | 2,740 | 1,000,000 | 29.0 |
| | | Qata, 1979 | 4,707 | 11 | 16 | 2,740 | 6,000,000 | 28.0 |
| | | Quharir East, 1978 | ... | 2 | 4 | 2,740 | 1,000,000 | 25.5 |
| | | Rahab, 1978 | 3,237 | 21 | 28 | 2,740 | 9,000,000 | 25.0 |
| | | Rajaa, 1988 | ... | ... | ... | 2,740 | 1,000,000 | 50.0 |
| | | Ramlat Rawl, 1987 | 2,720 | 1 | 1 | 5,479 | 2,000,000 | 37.0 |
| | | Rima, 1979 | 3,247 | 47 | 48 | 71,233 | 179,000,000 | 33.0 |
| | | Runib, 1978 | 3,215 | 10 | 10 | 2,740 | 4,000,000 | 21.1 |
| | | Saih Nihayda, 1972 | 8,700 | 21 | 28 | 24,658 | 178,000,000 | 39.6 |
| | | Saih Rawl, 1973 | 9,826 | 14 | 24 | 8,219 | 97,000,000 | 39.0 |
| | | Sayyala, 1982 | 3,690 | 14 | 14 | 32,877 | 50,000,000 | 50.1 |
| | | Shibkah, 1988 | 2,591 | ... | 2 | 2,740 | 1,000,000 | 29.0 |
| | | Simsim, 1985 | 5,250 | 11 | 12 | 5,479 | 7,000,000 | 30.6 |
| | | Suwaihat, 1982 | 6,452 | 10 | 10 | 5,479 | 18,000,000 | 37.5 |
| | | Thamoud,, 1987 | 3,773 | ... | ... | 2,740 | 1,000,000 | 23.0 |
| | | Thuleilat, 1980 | ... | 14 | 15 | 2,740 | 4,000,000 | 25.5 |
| | | Wafra, 1983 | 5,510 | 7 | 8 | 5,479 | 6,000,000 | 38.8 |
| | | Warad, 1985 | 4,922 | 5 | 5 | 2,740 | 2,000,000 | 22.0 |
| | | Yibal, 1963 | 8,465 | 194 | 206 | 164,384 | 782,000,000 | 38.5 |
| | | Zahra, 1986 | 6,562 | 5 | 5 | 2,740 | 2,000,000 | 32.0 |
| | | Zareef, 1985 | 3,264 | 10 | 11 | 13,699 | 15,000,000 | 47.0 |
| | | Zauliyah, 1981 | 8,177 | 10 | 14 | 5,479 | 17,000,000 | 44.3 |
| | | Zumurud, 1988 | ... | ... | ... | 2,740 | 1,000,000 | 29.0 |
| | OCCIDENTAL | Safah, 1983 | 6,500 | 100 | 111 | 24,142 | 24,607,013 | 42.0 |
| | ELF GROUP | Ramlat | ... | 1 | 1 | 53 | 167,360 | 46.0 |
| | | Sahmah, 1978 | 12,400 | 11 | 11 | 5,127 | 28,351,500 | 46.0 |
| | | **Total Oman** | | 1,237 | 1,487 | 714,253 | 3,093,125,873 | |
| **PAKISTAN** | PAKISTAN(e) OILFIELD LTD. | Balkassar, 1946 | 9,398 | 4 | 17 | 44,978 | 186,743,036 | 26.0 |
| | | Dhulian, 1936 | 8,899 | 12 | 49 | | | 48.0 |
| | | Meyal, 1968 | 12,513 | 6 | 6 | | | 41.3 |
| | | Joya Mair, 1944 | 6,900 | 2 | 4 | | | 15.0 |
| | | Khaur, 1915 | 9,306 | 13 | 397 | | | 33.0 |
| | PAKISTAN PETROLEUM LTD.(e) | Adhi, 1978 | 9,452-9,613 | 5 | 5 | | | 51.0 |
| | OGDC(e) | Bobi, 1988 | 9,515-7,897 | 3 | 3 | | | 52.0 |
| | | Chak-Naurang, 1986 | 9,187 | 3 | 4 | | | 12.1 |
| | | Fimkassar, 1982 | 11,465 | 1 | 1 | | | 29.4 |
| | | Ghotana, 1986 | 7,300 | 1 | 1 | | | 41.1 |
| | | Lashari Centre, 1988 | 6,916 | 1 | 1 | | | 44.2 |
| | | Pasahki, 1989 | 7,153 | 1 | 1 | | | 43.0 |
| | | Sono, 1988 | 7,618 | 3 | 4 | | | 40.5 |
| | | Tando Alam, 1984 | 6,890-7,448 | 4 | 10 | | | 41.7 |
| | | Thora, 1987 | 7,546 | 5 | 5 | | | 42.2 |
| | | Toot, 1968 | 15,135 | 5 | 14 | | | 39.0 |
| | UNION TEXAS(e) | Dabhi, 1984 | 5,594 | 2 | 4 | | | 42.0 |
| | | Khaskeli, 1981 | 3,387 | 4 | 11 | | | 38.0 |
| | | Laghari, 1983 | 2,584 | 4 | 7 | | | 42.0 |
| | | Mazari, 1985 | 3,888 | 5 | 5 | | | 43.0 |
| | | South Mazari, 1985 | 3,920 | 2 | 4 | | | 43.0 |
| | | Other | ... | 7 | 8 | | | 31.0-46.0 |
| | OCCIDENTAL | Bhangali, 1989 | 12,650 | 1 | 1 | 1,783 | 856,773 | 32.5 |
| | | Dhurnal, 1984 | 13,100 | 3 | 6 | 15,239 | 34,136,376 | 38.0 |
| | | **Total Pakistan** | | 97 | 568 | 62,000 | 221,736,186 | |
| **PERU** | PETROMAR S.A. | • Litoral, 1955 | 1,500-6,000 | 91 | 134 | 1,925 | 38,858,380 | 36.0-40.0 |
| | | • Lobitos, 1960 | 3,500-7,500 | 137 | 278 | 9,554 | 58,278,603 | 38.0 |
| | | • Pena Negra, 1960 | 3,000-8,500 | 147 | 306 | 7,909 | 115,445,768 | 38.0 |

| | | Name of field, discovery date | Depth, ft | No. of wells Producing | No. of wells Total | Production 1990 average b/d | Production Cumulative to Dec. 31, 1990 bbl | °API gravity |
|---|---|---|---|---|---|---|---|---|
| | | ● Providencia, 1967 | 3,000-7,000 | 45 | 93 | 1,831 | 22,550,885 | 38.0-40.0 |
| | | Other | ... | 2 | 24 | 54 | 31,541 | ... |
| | OCCIDENTAL | Bartra, 1979 | 8,000-8,930 | 14 | 18 | 5,306 | 21,152,135 | 11.6 |
| | | Capahuari Sur, 1973 | 11,800-12,900 | 15 | 27 | 7,116 | 137,405,946 | 33.7 |
| | | Dorissa, 1978 | 9,800-10,600 | 5 | 13 | 7,386 | 42,117,899 | 32.0 |
| | | Forestal, 1973 | 9,000-9,900 | 8 | 12 | 6,177 | 38,586,174 | 18.5 |
| | | Huayuri Sur, 1977 | 10,000-10,800 | 9 | 12 | 3,451 | 20,765,040 | 28.5 |
| | | Jibarito, 1981 | 9,000-9,650 | 2 | 5 | 5,053 | 15,031,365 | 10.5 |
| | | Jibero, 1974 | 10,110-10,155 | 5 | 6 | 3,071 | 9,451,868 | 10.6 |
| | | San Jacinto, 1978 | 7,200-9,760 | 9 | 22 | 5,831 | 33,219,653 | 14.9 |
| | | Shiviyacu, 1973 | 9,100-10,100 | 19 | 27 | 17,908 | 78,133,229 | 20.3 |
| | | Other | ... | 2 | 13 | 2,157 | 3,094,912 | 21.3 |
| | OCCIDENTAL/BRIDAS | Talara area, 1978 | 1,343-6,080 | 761 | 1,101 | 5,983 | 50,797,833 | 34.8 |
| | PETROPERU | Agua Caliente, 1939 | 1,000-15,000 | 7 | 12 | 119 | 14,416,391 | 42.0 |
| | | Capirona, 1972 | 9,800-12,000 | 1 | 5 | 407 | 3,891,327 | 25.0 |
| | | Corrientes, 1971 | 10,000-12,600 | 28 | 36 | 16,709 | 107,634,867 | 24.9 |
| | | Maquia, 1957 | 2,100-2,400 | 19 | 29 | 1,860 | 13,610,702 | 37.5 |
| | | N. Esperanza, 1980 | 10,200-10,700 | ... | 3 | 498 | 5,752,323 | 42.5 |
| | | Pacaya, 1983 | ... | ... | 3 | ... | 52,397 | ... |
| | | Pavayacu, 1972 | 9,600-11,300 | 9 | 14 | 2,527 | 18,381,009 | 29.5 |
| | | Selva Central | ... | ... | ... | ... | ... | 36.0 |
| | | Talara-Lima area, 1869 | 2,000-9,000 | 1,958 | 6,154 | 18,856 | 986,866,673 | 32.3 |
| | | Valencia, 1975 | 10,500-11,200 | ... | 2 | ... | 546,548 | 43.0 |
| | | Yanayacu, 1974 | 11,400-13,600 | 6 | 9 | 752 | 4,779,917 | 18.8 |
| | | **Total Peru** | | **3,299** | **8,356** | **131,430** | **1,823,132,975** | |
| **PHILIPPINES** | ALCORN PHILIPPINES | ● Galoc, 1981 | 7,260-7,280 | ... | 1 | ... | 383,460 | 37.2 |
| | | ● Matinloc, 1978 | 6,656-6,750 | 3 | 5 | 815 | 10,162,235 | 43.8 |
| | | ● Nido, 1977 | 6,576-6,885 | 3 | 5 | 565 | 16,262,931 | 27.1 |
| | | ● North Matinloc, 1987 | 6,830-7,021 | 3 | 3 | 2,107 | 1,692,091 | 43.2 |
| | ALCORN PALAWAN | ● Cadlao, 1977 | 5,734-5,881 | 2 | 2 | 1,235 | 10,897,569 | 45.6 |
| | TRANS-ASIA OIL & MINERAL | ● South Tara, 1987 | 4,335-4,436 | ... | 1 | 45 | 221,408 | 40.4 |
| | | **Total Philippines** | | **11** | **17** | **4,767** | **39,619,694** | |
| **QATAR** | QGPC | ● Bul Hanine, 1970 | 6,000 | 20 | 35 | 127,793 | 821,534,316 | 35.0 |
| | | Dukhan, 1940 | 6,500 | 182 | 237 | 217,435 | 2,647,267,520 | 41.1 |
| | | ● Idd El Shargi, 1960 | 4,500-6,250 | 17 | 42 | 9,999 | 207,075,108 | 35.0 |
| | | ● Maydan-Mahzam, 1963 | 7,000 | 19 | 41 | 50,410 | 790,017,582 | 36.0 |
| | | **Total Qatar** | | **238** | **355** | **405,637** | **4,465,894,526** | |
| **RAS al KHAIMAH(e)** | RAKOPET | ● Saleh, 1983 | 14,500 | 7 | 7 | 750 | 12,775,000 | 50.0 |
| | | **Total Ras al Khaimah** | | **7** | **7** | **750** | **12,775,000** | **50.0** |
| **SAUDI ARABIA(e)** | ARAMCO | Abqaiq, 1940 | 6,690 | 1,236 | 1,236 | 6,257,800 | 59,818,621,094 | 37.0 |
| | | Abu-Hadriya, 1940 | 9,340 | | | | | 35.0 |
| | | Abu Jifan | ... | | | | | ... |
| | | ● Abu-Safah, 1963 | 6,600 | | | | | 30.0 |
| | | Bakr | ... | | | | | ... |
| | | ● Berri, 1964 | 8,300 | | | | | 32.0-34.0 |
| | | Dammam, 1938 | 4,800 | | | | | 35.0 |
| | | Dhib | ... | | | | | ... |
| | | Dibdibeh | ... | | | | | ... |
| | | Duhul | ... | | | | | ... |
| | | El Haba | ... | | | | | ... |
| | | Fadhili, 1949 | 8,050 | | | | | 39.0 |
| | | Farhah | ... | | | | | ... |
| | | Faridah | ... | | | | | ... |
| | | Ghawar, 1948 | 6,920 | | | | | 34.0 |
| | | Habari | ... | | | | | ... |
| | | ● Hamur | ... | | | | | ... |
| | | Harmaliyah, 1971 | 8,430 | | | | | 36.0 |
| | | ● Harqus | ... | | | | | ... |
| | | ● Hasbah | ... | | | | | ... |
| | | Jaham | ... | | | | | ... |
| | | Jaladi | ... | | | | | ... |
| | | ● Jana | ... | | | | | ... |
| | | Jauf | ... | | | | | ... |
| | | Jawb | ... | | | | | ... |
| | | Juraybi'at | ... | | | | | ... |
| | | ● Jurayd | ... | | | | | ... |
| | | ● Karan | ... | | | | | ... |
| | | Khurais, 1957 | 5,200 | | | | | 33.0 |
| | | Khursaniyah, 1956 | 6,560 | | | | | 31.0 |
| | | ● Kurayn | ... | | | | | ... |
| | | ● Lawhah | ... | | | | | ... |

WORLDWIDE PRODUCTION

| | | Name of field, discovery date | Depth, ft | No. of wells — Producing | No. of wells — Total | Production — 1990 average b/d | Production — Cumulative to Dec. 31, 1990 bbl | °API gravity |
|---|---|---|---|---|---|---|---|---|
| | | Lughfah | ... | | | | | ... |
| | | • Maharah | ... | | | | | ... |
| | | • Manifa, 1957 | 7,950 | | | | | ... |
| | | • Marjan, 1967 | 6,800 | | | | | 33.0 |
| | | Mazalij | ... | | | | | ... |
| | | Qatif, 1945 | 7,100 | | | | | 33.0-34.0 |
| | | Qirdi | ... | | | | | ... |
| | | • Ribyan | ... | | | | | ... |
| | | Rimthan | ... | | | | | ... |
| | | • Safaniya, 1951 | 5,100 | | | | | 27.0 |
| | | Sahba | ... | | | | | ... |
| | | Samin | ... | | | | | ... |
| | | Sharar | ... | | | | | ... |
| | | Suban | ... | | | | | ... |
| | | Tinat | ... | | | | | ... |
| | | Wari'ah | ... | | | | | ... |
| | | Watban | ... | | | | | ... |
| | | • Zuluf, 1965 | 5,800 | | | | | 32.0 |
| | | **Total Saudi Arabia** | | 1,235 | 1,235 | 6,257,500 | 59,818,821,094 | |
| **SHARJAH** | AMOCO | Saaja and Moveyid[c], 1980 | 10,200-12,300 | 16 | 16 | 22,560 | 123,667,200 | 50.0 |
| | CRESCENT[e] | • Mubarek,[c] 1972 | 12,650 | 4 | 4 | 5,000 | 101,275,000 | 50.0 |
| | | **Total Sharjah** | | 20 | 20 | 27,560 | 224,942,200 | |
| **SPAIN** | SHELL ESPANA | • Amposta Marino Norte, 1970 | 10,000 | ... | 5 | ... | 55,667,000 | 37.0 |
| | | • Tarraco (Castellon B5/8), 1973 | 9,000 | ... | 3 | ... | 14,547,000 | 35.0 |
| | CHEVRON | Ayoluengo, 1964 | 4,600-5,200 | 35 | 43 | 582 | 15,592,664 | 37.0 |
| | REPSOL | • Angula, 1984 | 12,600 | ... | 1 | ... | ... | 44.0 |
| | | • Casablanca, 1975 | 8,900 | 7 | 9 | 13,487 | 100,344,916 | 33.0 |
| | | • Dorada, 1975 | 6,700 | ... | 4 | ... | 17,843,906 | 21.5 |
| | | • Gaviota[c], 1980 | 8,300 | 2 | 3 | 2,111 | 3,043,131 | 52.7 |
| | | • Salmonete, 1984 | 12,600 | ... | 1 | ... | ... | 44.0 |
| | | **Total Spain** | | 44 | 72 | 16,180 | 207,038,617 | |
| **SURINAME** | STAATSOLIE | Tambaredjo, 1981 | 1,050 | 153 | 153 | 3,935 | 6,297,277 | 15.9 |
| | | **Total Suriname** | | 153 | 153 | 3,935 | 6,297,277 | |
| **SYRIA** | AL FURAT OIL CO. (SHELL) | Al Ishara East, 1986 | ... | ... | ... | 7,397 | 8,100,000 | 38.1 |
| | | Al Kharrata East, 1986 | ... | ... | ... | 822 | 900,000 | 37.5 |
| | | El Ahmar, 1986 | ... | ... | ... | 4,384 | 6,100,000 | 34.8 |
| | | El Isba, 1988 | ... | ... | ... | 15,068 | 8,200,000 | 37.0 |
| | | El Ward North, 1986 | ... | ... | ... | 26,027 | 24,000,000 | 38.1 |
| | | Jamol, 1990 | ... | ... | ... | 1,918 | 700,000 | 39.0 |
| | | Jido, 1986 | ... | ... | ... | 1,370 | 3,100,000 | 35.0 |
| | | Malch, 1990 | ... | ... | ... | 274 | 100,000 | 34.0 |
| | | Omar, 1987 | ... | ... | ... | 18,356 | 21,100,000 | 41.5 |
| | | Omar North, 1989 | ... | ... | ... | 7,945 | 3,300,000 | 45.0 |
| | | Ratka, 1983 | ... | ... | ... | 5,479 | 2,000,000 | 34.5 |
| | | Saban, 1989 | ... | ... | ... | 6,027 | 2,200,000 | 40.0 |
| | | Sarhit, 1988 | ... | ... | ... | 2,740 | 1,100,000 | 41.0 |
| | | Shahel, 1988 | ... | ... | ... | 6,849 | 3,000,000 | 40.5 |
| | | Shdeha, 1989 | ... | ... | ... | 4,110 | 1,500,000 | 35.0 |
| | | Sijan, 1989 | ... | ... | ... | 28,219 | 10,400,000 | 35.0 |
| | | Tanak, 1987 | ... | ... | ... | 20,822 | 11,100,000 | 36.5 |
| | | Tayyani East, 1989 | ... | ... | ... | 8,493 | 5,600,000 | 36.0 |
| | | Thayyem, 1983 | ... | ... | ... | 79,726 | 112,700,000 | 36.5 |
| | S.P.C.[e] | Alian, 1974 | 5,900 | 25 | 37 | | | 19.0 |
| | | Gbebeh, 1976 | 2,300 | 54 | 75 | | | 18.0 |
| | | Jebisseh, 1968 | 2,000-3,300 | 132 | 219 | | | 18.0 |
| | | Karachok, 1956 | 6,500 | 103 | 119 | 141,973 | 1,193,315,220 | 20.0 |
| | | Rumilan, 1962 | 6,500 | 59 | 66 | | | 24.0 |
| | | Soudie, 1959 | 6,500 | 532 | 579 | | | 24.0 |
| | | Tichrine, 1976 | 2,600 | 58 | 73 | | | 18.0 |
| | | **Total Syria** | | 963 | 1,168 | 388,000 | 1,418,515,220 | |
| **THAILAND** | UNOCAL | • Baanpot[C], 1990 | 7,000 | 19 | 30 | 1,172 | 3,124,380 | 54.0 |
| | | • Erawan[C], 1973 | 7,000 | 96 | 165 | 7,919 | 22,291,090 | 54.6 |
| | | • Kaphong[C], 1974 | 8,000 | 18 | 24 | 2,640 | 1,293,680 | 56.0 |
| | | • Platong[C], 1976 | 8,500 | 20 | 49 | 1,526 | 7,148,380 | 58.1 |
| | | • Satun[C], 1980 | 8,500 | 62 | 68 | 5,951 | 10,156,570 | 55.1 |
| | | • South Satun[C], 1980 | ... | 16 | 22 | 198 | 72,160 | 54.0 |
| | THAI SHELL | Sirikit, 1981 | 5,280-5,976 | 67 | 103 | | | 19.0 |
| | | Pru Krathiam, 1984 | 4,200 | 1 | 2 | 22,750 | | 19.0 |
| | | Pratu Tao, 1981 | | 1 | 1 | | 50,477,850 | 41.0 |
| | | Sirikit West, 1989 | 5,800 | ... | ... | | | 41.0 |

| | | | | No. of wells | | Production | | |
|---|---|---|---|---|---|---|---|---|
| | | Name of field, discovery date | Depth, ft | Producing | Total | 1990 average b/d | Cumulative to Dec. 31, 1990 bbl | °API gravity |
| | | Thap Raet, 1989 | 11,100 | ... | ... | | | 41.0 |
| | | Wat Taen, 1988 | 7,790 | ... | ... | | | 37.0-40.0 |
| | | **Total Thailand** | | **299** | **464** | **42,165** | **94,564,120** | |
| **TRINIDAD AND TOBAGO** | **AMOCO TRINIDAD OIL CO. LTD.** | • Cassia, 1973 | 12,700 | 9 | 9 | 3,601 | 15,499,000 | ... |
| | | Mora, 1982 | 8,500 | 2 | 2 | 254 | 821,000 | ... |
| | | • Poui, 1974 | 11,650 | 38 | 40 | 18,609 | 171,384,000 | ... |
| | | • Samaan, 1971 | 11,780 | 37 | 47 | 13,050 | 189,511,000 | ... |
| | | • Teak, 1969 | 15,191 | 60 | 71 | 39,614 | 265,671,000 | ... |
| | **TRINIDAD & TOBAGO OIL CO. LTD. (TRINTOC)(e)** | Area IV and Guapo, 1963 | | 85 | 192 | 75,663 | 1,911,965,000 | ... |
| | | Barrackpore, 1911 | 11,100 | 83 | 379 | | | ... |
| | | Brighton, 1903 | 7,500 | 59 | 620 | | | ... |
| | | Catshill, 1950 | 9,693 | 31 | 134 | | | ... |
| | | Forest Reserve, 1913 | 11,000 | 289 | 2,042 | | | ... |
| | | Grand Ravine, 1929 | 11,000 | 51 | 168 | | | ... |
| | | Guayaguayare, 1902 | 10,750 | 115 | 699 | | | ... |
| | | Oropouche, 1944 | 9,100 | 29 | 128 | | | ... |
| | | Palo Seco, 1929 | 12,700 | 77 | 939 | | | ... |
| | | Parrylands 1-5, 1913 | 10,626 | 118 | 508 | | | ... |
| | | Penal, 1936 | 11,067 | 78 | 289 | | | ... |
| | | Point Fortin C & W, 1907 | 10,626 | 124 | 551 | | | ... |
| | | Trinity, 1956 | 9,700 | 20 | 95 | | | ... |
| | | Other | ... | 63 | 813 | | | ... |
| | **TRINIDAD NORTHERN(e) AREAS (TNA)** | • Fortin Offshore (FOS), 1954 | ... | 12 | 35 | | | ... |
| | | • Soldado, 1955 | 11,000 | 371 | 673 | | | ... |
| | **TRINIDAD & TOBAGO PETROLEUM CO. LTD. (TRINTOPEC)(e)** | Centarl Los Bajos, 1973 | ... | 162 | 221 | | | ... |
| | | Coora/Quarry, 1936 | 14,000 | 151 | 736 | | | ... |
| | | Fyzabad/Apex/Quarry, 1920-38 | 11,000 | 300 | 1,042 | | | ... |
| | | Galeota, 1963 | 6,304 | 47 | 105 | | | ... |
| | | Palo Seco/Erin/McKenzie, 1926 | 12,718 | 493 | 1,581 | | | ... |
| | | Other | ... | 196 | 923 | | | ... |
| | **PREMIER CONSOLIDATED OILFIELDS LTD. (P.C.O.L)(e)** | All fields | ... | 103 | 503 | | | ... |
| | | **Total Trinidad and Tobago** | | **3,203** | **13,545** | **150,791** | **2,554,851,000** | |
| **TUNISIA** | **ELF-ETAP** | • Ashtart | 10,500 | 15 | 20 | 25,682 | 202,419,879 | 29.8 |
| | **ELF-SEREPT** | Douleb/Semmama, 1966 | 3,937 | 12 | 15 | 539 | 18,351,768 | 40.0 |
| | | Tamesmida, 1967 | 3,937 | 3 | 3 | 160 | 2,209,426 | 36.9 |
| | **ETAP-AGIP-FINA (SODEPS)** | Debech, 1980 | 7,500 | 1 | 1 | 17 | 265,730 | 42.8 |
| | | Larich, 1979 | 7,550 | 1 | 2 | 107 | 353,070 | 41.0 |
| | | Makrouga, 1980 | 6,230 | 4 | 4 | 5,690 | 9,644,920 | 45.6 |
| | **AGIP-TUNISIA (SITEP)** | Couech es Seida, 1971 | 12,600 | 1 | 1 | 250 | 2,892,240 | 43.2 |
| | | El Borma, 1964 | 8,250-8,900 | 95 | 130 | 50,950 | 559,242,860 | ... |
| | **BRITISH GAS** | El Ain, 1980 | 8,500 | 1 | 1 | 1,684 | 1,243,000 | 41.0 |
| | **MARATHON** | Ezzaouia, 1986 | 6,800 | 5 | 5 | 2,000 | 715,000 | 40.0 |
| | **SHELL(e)** | • Tazerka, 1979 | ... | ... | ... | 2,886 | 164,925,365 | 30.0 |
| | **CFPT(e)** | Sidi El Itayem, 1971 | 7,500-7,800 | 21 | 23 | 2,507 | | 44.0 |
| | | **Total Tunisia** | | **159** | **205** | **92,472** | **962,263,258** | |
| **TURKEY** | **ALADDIN MIDDLE EAST LTD.** | Kahta, 1958 | 3,500 | 11 | 25 | 142 | 4,182,072 | 11.0 |
| | | Yasince, 1974 | 6,400 | 2 | 4 | 10 | 13,752 | 31.0 |
| | | Zeynel, 1990 | 4,700 | 1 | 1 | 11 | 3,909 | 23.0 |
| | **MOBIL** | Bulgurdağ, 1961 | 4,500 | 2 | 2 | 37 | 2,509,803 | 37.2 |
| | | Selmo, 1964 | 5,800 | 22 | 22 | 3,995 | 69,540,465 | 34.2 |
| | **SHELL** | Barbes, 1972 | ... | 18 | 22 | 1,260 | 17,260,000 | 37.2 |
| | | Baysu, 1985 | ... | 6 | 7 | 904 | 1,490,000 | 34.5 |
| | | Bektas, 1985 | ... | 1 | 1 | 274 | 540,000 | 34.7 |
| | | Beykan, 1964 | ... | 38 | 48 | 2,356 | 61,520,000 | 33.2 |
| | | Kastel, 1990 | ... | ... | ... | 356 | 130,000 | 34.7 |
| | | Katin, 1971 | ... | 3 | 8 | 82 | 3,760,000 | 29.7 |
| | | Kay West (deep), 1970 | ... | ... | ... | 1,507 | 550,000 | 34.1 |
| | | Kayako West (OF), 1984 | ... | 19 | 29 | 767 | 31,720,000 | 34.1 |
| | | Kayakoy, 1980 | ... | 14 | 27 | 1,288 | 20,670,000 | 38.2 |
| | | Kopru, 1990 | ... | ... | ... | 27 | 10,000 | 35.2 |
| | | Kurkan, 1963 | ... | 29 | 35 | 1,315 | 50,100,000 | 31.4 |
| | | Kurkan S, 1965 | ... | 5 | 10 | 1,233 | 7,690,000 | 34.5 |
| | | Malatepe, 1970 | ... | 14 | 15 | 575 | 7,400,000 | 32.7 |
| | | Nortern Trend, 1972 | ... | ... | ... | 82 | 350,000 | 30.0 |
| | | Piyanko, 1968 | ... | 1 | 3 | 82 | 1,550,000 | 35.3 |
| | | Sahaban, 1965 | ... | 7 | 13 | 712 | 13,700,000 | 34.5 |
| | | Sahaban SE, 1983 | ... | 2 | 2 | 110 | 510,000 | 34.5 |
| | | Sincan, 1979 | ... | 8 | 9 | 877 | 3,640,000 | 31.4 |
| | | Yatir E, 1973 | ... | 9 | 11 | 274 | 5,550,000 | 30.9 |
| | | Yenikoy E, 1974 | ... | 2 | 2 | 356 | 4,700,000 | 31.3 |
| | | Yesildere, 1985 | ... | 3 | 3 | 775 | 880,000 | 34.5 |

WORLDWIDE PRODUCTION

| | | Name of field, discovery date | Depth, ft | No. of wells Producing | No. of wells Total | Production 1990 average b/d | Production Cumulative to Dec. 31, 1990 bbl | °API gravity |
|---|---|---|---|---|---|---|---|---|
| | TPAO | Adiyaman, 1971 | 5,800 | 10 | 10 | 685 | 8,671,031 | 27.6 |
| | | Akpinar, 1984 | 10,500 | — | — | — | 157,937 | 31.6 |
| | | Alcik, 1983 | 6,500 | 1 | 1 | 4 | 96,864 | 32.0 |
| | | B. Firat, 1986 | 8,150 | 11 | 11 | 134 | 1,803,829 | 34.8 |
| | | B. Kozluca, 1985 | 5,000 | 23 | 23 | 727 | 1,828,855 | 12.0 |
| | | B. Selmo, 1961 | 5,500 | 3 | 3 | 179 | 804,469 | 34.0 |
| | | Bati Raman, 1961 | 4,200 | 149 | 149 | 9,026 | 41,187,581 | 13.3 |
| | | Besikli, 1989 | 6,234 | 3 | 3 | 1,118 | 408,041 | 25.6 |
| | | Beycayir, 1976 | 7,700 | 1 | 1 | 31 | 219,201 | 26.4 |
| | | Bolukyayla, 1977 | 10,300 | ... | ... | ... | 167,663 | 35.0 |
| | | Camurlu, 1976 | 5,600 | 14 | 14 | 301 | 1,296,898 | 12.2 |
| | | Celikli, 1964 | 10,500 | 11 | 11 | 616 | 4,046,269 | 35.2 |
| | | Cemberlitas, 1983 | 8,500 | 17 | 17 | 1,865 | 8,815,619 | 30.5 |
| | | Cendere (J.V.), 1989 | 8,856 | 3 | 3 | 1,453 | 530,204 | 29.4 |
| | | Cukurtas, 1965 | 10,000 | ... | ... | ... | 219,021 | 36.0 |
| | | Devecatak, 1973 | 4,800 | 2 | 2 | 77 | 299,035 | 37.0 |
| | | G. Adiyaman, 1977 | 5,000 | ... | ... | ... | 115,836 | 20.4 |
| | | G. Dincer, 1981 | 5,350 | 14 | 14 | 846 | 5,170,219 | 16.7 |
| | | G. Karakus, 1989 | 7,900 | 3 | 3 | 1,049 | 422,656 | 26.5 |
| | | G. Kayaköy, 1976 | 8,600 | 1 | 1 | 160 | 2,405,770 | 30.4 |
| | | G. Sahaban, 1978 | 5,450 | 7 | 7 | 455 | 3,400,791 | 33.2 |
| | | G. Saricak, 1973 | 5,250 | 10 | 10 | 517 | 4,573,485 | 31.5 |
| | | Garzan, 1956 | 4,700 | 16 | 16 | 1,192 | 33,820,729 | 26.2 |
| | | Germik, 1958 | 6,500 | 9 | 9 | 223 | 3,589,634 | 18.3 |
| | | Ikiztepe, 1976 | 4,900 | ... | ... | ... | 88,051 | 11.3 |
| | | K. Karakus, 1989 | 8,498 | 5 | 5 | 5,272 | 1,962,077 | 29.0 |
| | | K. Osmancik, 1971 | 3,800 | 3 | 3 | 229 | 2,259,094 | 37.6 |
| | | Karaali (J.V.), 1989 | 9,941 | 1 | 1 | 194 | 162,051 | 24.6 |
| | | Karakus, 1988 | 8,850 | 15 | 15 | 17,736 | 9,672,352 | 30.0 |
| | | Karteltepe, 1982 | 6,500 | 3 | 3 | 293 | 1,124,863 | 32.0 |
| | | Kastel (J.V.), 1989 | 7,625 | 2 | 2 | 727 | 265,386 | 34.7 |
| | | Kurtalan, 1961 | 5,750 | 1 | 1 | 20 | 259,455 | 31.9 |
| | | Kuzey Adiyaman, 1977 | 9,500 | ... | ... | ... | 59,375 | 32.0 |
| | | Mağrip, 1961 | 5,700 | 9 | 9 | 619 | 15,336,442 | 18.4 |
| | | Mehmetdere, 1962 | 6,700 | ... | ... | ... | 157,439 | 31.0 |
| | | Oyuktas, 1972 | 7,600 | ... | ... | ... | 592,005 | 31.0 |
| | | Raman, 1940 | 4,500 | 77 | 77 | 4,042 | 53,538,328 | 18.7 |
| | | S. Sinan, 1967 | 3,900 | 4 | 4 | 80 | 148,048 | 13.0 |
| | | Saricak, 1973 | 5,250 | 4 | 4 | 204 | 2,811,755 | 31.5 |
| | | Sezgin, 1970 | 5,600 | ... | ... | ... | 87,559 | 17.0 |
| | | Silivanka, 1962 | 8,200 | 11 | 11 | 728 | 8,473,463 | 23.0 |
| | | Sivritepe, 1977 | 8,200 | ... | ... | ... | 591,789 | 33.4 |
| | | Yanarsu, 1990 | 4,725 | 1 | 1 | 26 | 9,520 | 14.7 |
| | | Yeniköy, 1973 | 6,400 | 23 | 23 | 2,006 | 10,500,534 | 31.4 |
| | | **Total Turkey** | | **684** | **766** | **72,241** | **542,121,224** | |
| **UNITED KINGDOM** | **AMOCO** | • Arbroath, 1969 | 8,100 | 7 | 10 | 22,576 | 8,240,157 | 37.0 |
| | | • Indefatigable(C), 1966 | 8,500 | 33 | 39 | 463 | 4,675,302 | 46.0 |
| | | • Leman (ELU)(C), 1966 | 6,500 | 84 | 91 | 302 | 3,476,642 | 51.0 |
| | | • Montrose, 1969 | 8,100 | 14 | 20 | 1,392 | 80,121,321 | 37.0 |
| | | • NW Hutton, 1975 | 11,200 | 30 | 39 | 17,694 | 105,342,717 | 36.0 |
| | **BP** | • Beatrice (A & B), 1976 | 6,750 | 27 | 39 | 24,808 | 3,126,892,477 | 38.4 |
| | | • Buchan, 1974 | 8,700 | 9 | 9 | 17,553 | | 33.0 |
| | | • Clyde, 1978 | 12,400 | 10 | 30 | 38,257 | | 38.1 |
| | | • Cyrus, 1979 | 8,265 | 2 | 4 | 5,526 | | 35.5 |
| | | • Deveron, 1972 | 9,000 | 3 | 3 | 4,495 | | 38.2 |
| | | • Don, 1976 | 11,200 | 3 | 4 | 6,238 | | 42.0 |
| | | East Midlands, 1939 | 3,500 | 65 | 132 | 24,204 | | 36.0 |
| | | • Forties and Echo, 1970 | 7,000 | 79 | 103 | 193,024 | | 37.0 |
| | | Kimmeridge, 1959 | 1,705 | 1 | 1 | 37,004 | | 40.0 |
| | | • Magnus, 1974 | 9,500 | 11 | 11 | 135,427 | | 39.0 |
| | | Nettleham, 1983 | 8,850 | 1 | 2 | 7,762 | | 35.0 |
| | | Scampton, 1985 | 5,360 | 1 | 3 | 7,305 | | ... |
| | | Stainton, 1984 | 5,200 | 1 | 3 | 443 | | ... |
| | | • Thistle, 1973 | 9,000 | 33 | 52 | 29,731 | | 38.0 |
| | | Welton, 1981 | 5,000 | ... | ... | 40,262 | | 36.0 |
| | | Wytch Farm Bridport Sand, 1974 | 3,031 | 10 | 16 | ... | | 37.0 |
| | | Wytch Farm Sherwood Sandstone, 1978 | 5,198 | 5 | 5 | ... | | 37.9 |
| | **CHEVRON** | • Ninian, 1974 | 10,000 | 74 | 105 | 116,903 | 900,856,024 | 35.6 |
| | **CONOCO** | • Hutton, 1973 | 10,000 | 15 | 27 | 28,632 | 127,881,199 | 33.0 |
| | | • Murchison*, 1975 | 9,900 | 21 | 34 | 28,509 | 223,083,803 | 38.0 |
| | **HAMILTON BROS. OIL & GAS LTD.** | • Argyll, 1971 | 9,000-9,400 | 7 | 7 | 4,920 | 70,030,000 | 38.0 |
| | | • Crawford, 1975 | 6,900-6,500 | 5 | 5 | 4,940 | 3,930,000 | 30.0 |
| | | • Duncan, 1980 | 9,600-10,000 | 2 | 2 | 1,060 | 18,370,000 | 36.0 |
| | | • Innes, 1983 | 12,300-12,800 | 2 | 2 | 850 | 5,750,000 | 45.0 |
| | **MARATHON** | • Central Brae, 1976 | 14,100-15,000 | 3 | 5 | 15,500 | 7,000,000 | 33.0 |
| | | • North Brae(c), 1975 | 11,800-12,475 | 11 | 16 | 80,400 | 66,000,000 | 45.0 |
| | | • South Brae, 1975 | 12,700-13,437 | 12 | 29 | 33,400 | 226,000,000 | 35.0 |

WORLDWIDE PRODUCTION

| | Name of field, discovery date | Depth, ft | No. of wells<br>Producing | No. of wells<br>Total | Production<br>1990 average b/d | Production<br>Cumulative to Dec. 31, 1990 bbl | °API gravity |
|---|---|---|---|---|---|---|---|
| **MOBIL** | ● Beryl, 1972 | 9,900-11,500 | 41 | 67 | 94,700 | 461,983,427 | 37.0 |
| | ● Linnhe, 1988 | 11,600-12,065 | 1 | 2 | 1,100 | 577,286 | 37.8 |
| | ● Ness, 1986 | 9,900-10,112 | 4 | 6 | 10,400 | 16,977,501 | 37.0 |
| **OCCIDENTAL** | ● Claymore, 1974 | 8,100 | 17 | 29 | 39,525 | 339,020,933 | 30.1 |
| | ● Piper, 1973 | 8,100 | ... | ... | ... | 834,416,000 | 37.0 |
| | ● Scapa, 1981 | 8,100 | 5 | 5 | 24,850 | 30,359,688 | 32.0 |
| **SHELL** | ● Auk, 1971 | ... | 9 | 11 | 8,219 | 85,700,000 | 38.0 |
| | ● Brent, 1971 | ... | 53 | 130 | 73,973 | 1,304,400,000 | 40.0 |
| | ● Cormorant, 1972 | ... | 17 | 37 | 86,027 | 355,600,000 | 36.0 |
| | ● Dunlin, 1973 | ... | 26 | 40 | 22,669 | 325,528,000 | 36.0 |
| | ● Eider, 1976 | ... | ... | ... | 40,548 | 30,000,000 | 34.0 |
| | ● Fulmar, 1975 | ... | 13 | 28 | 149,247 | 446,620,000 | 40.0 |
| | ● Kittiwake, 1981 | ... | ... | ... | 5,205 | 1,900,000 | 30.0 |
| | ● Tern, 1975 | ... | ... | ... | 34,247 | 18,900,000 | 34.0 |
| **PHILLIPS** | ● Maureen, 1973 | 8,000-8,700 | 6 | 12 | 32,006 | 166,560,640 | 35.9 |
| **TEXACO NORTH SEA** | ● Highlander, 1976 | 8,759-9,372 | 5 | 7 | 18,000 | 47,423,000 | 34.0 |
| | ● Petronella, 1975 | 8,110 | 1 | 1 | 12,300 | 15,232,000 | 40.2 |
| | ● Tartan, 1974 | 10,217-12,614 | 8 | 20 | 16,200 | 78,108,000 | 38.0 |
| **TOTAL OIL MARINE** | ● Alwyn North, 1975 | 10,170-11,155 | 10 | 30 | 89,400 | 90,210,500 | 39.0 |
| **UNOCAL** | ● Heather, 1973 | 10,800 | 24 | 40 | 11,040 | 88,209,901 | 34.3 |
| **ELF UK** | Crosby-Warren, 1986 | ... | ... | ... | 129 | 306,000 | ... |
| **STATOIL**[*] | ● Statfjord, 1975 | 9,500 | 59 | 93 | 108,616 | 315,020,800 | 39.0 |
| | **Total United Kingdom** | | 880 | 1,406 | 1,807,809 | 10,030,701,408 | |

*U.K. share (77.8%) of total production.

## UNITED STATES*

| | Name of field, discovery date | Depth, ft | No. of wells<br>Producing | No. of wells<br>Total | Production<br>1990 average b/d | Production<br>Cumulative to Dec. 31, 1990 bbl | °API gravity |
|---|---|---|---|---|---|---|---|
| | Alabama, 1944 | ... | 902 | ... | 50,789 | 321,538,000 | ... |
| | Alaska, 1905 | ... | 1,392 | ... | 1,773,452 | 9,122,310,000 | ... |
| | Arizona, 1958 | ... | 24 | ... | 334 | 19,728,000 | ... |
| | Arkansas, 1921 | ... | 7,565 | ... | 28,458 | 1,644,387,000 | ... |
| | California, 1861 | ... | 43,977 | ... | 961,370 | 22,701,900,000 | ... |
| | Colorado, 1887 | ... | 6,479 | ... | 83,436 | 1,584,454,000 | ... |
| | Florida, 1943 | ... | 92 | ... | 15,545 | 603,674,000 | ... |
| | Illinois, 1889 | ... | 32,158 | ... | 54,668 | 3,329,954,000 | ... |
| | Indiana, 1889 | ... | 7,525 | ... | 8,219 | 515,000,000 | ... |
| | Kansas, 1889 | ... | 45,220 | ... | 151,856 | 5,553,427,000 | ... |
| | Kentucky, 1860 | ... | 22,800 | ... | 14,825 | 707,411,000 | ... |
| | Louisiana, 1902 | ... | 26,759 | ... | 1,076,506 | 24,653,925,000 | ... |
| | Michigan, 1900 | ... | 5,064 | ... | 53,904 | 1,088,675,000 | ... |
| | Mississippi, 1889 | ... | 2,879 | ... | 74,063 | 2,221,033,000 | ... |
| | Missouri, 1889 | ... | 831 | ... | 400 | 4,159,000 | ... |
| | Montana, 1916 | ... | 3,924 | ... | 54,274 | 1,310,810,000 | ... |
| | Nebraska, 1939 | ... | 1,614 | ... | 16,137 | 453,890,000 | ... |
| | Nevada, 1954 | ... | 45 | ... | 10,992 | 30,586,000 | ... |
| | New Mexico, 1911 | ... | 18,167 | ... | 184,236 | 5,515,247,000 | ... |
| | New York, 1865 | ... | 4,197 | ... | 1,140 | 80,146,000 | ... |
| | North Dakota, 1951 | ... | 3,494 | ... | 100,592 | 1,016,716,000 | ... |
| | Ohio, 1860 | ... | 30,142 | ... | 27,419 | 982,008,000 | ... |
| | Oklahoma, 1891 | ... | 89,006 | ... | 307,600 | 13,272,274,000 | ... |
| | Pennsylvania, 1859 | ... | 24,778 | ... | 7,241 | 1,325,643,000 | ... |
| | South Dakota, 1954 | ... | 153 | ... | 4,515 | 21,537,000 | ... |
| | Tennessee, 1860 | ... | 725 | ... | 1,392 | 14,547,000 | ... |
| | Texas, 1889 | ... | 187,869 | ... | 1,925,866 | 61,028,941,000 | ... |
| | Utah, 1907 | ... | 2,103 | ... | 75,627 | 918,604,000 | ... |
| | Virginia, 1943 | ... | 23 | ... | 41 | 570,000 | ... |
| | West Virginia, 1860 | ... | 15,945 | ... | 5,871 | 558,143,000 | ... |
| | Wyoming, 1894 | ... | 11,466 | ... | 284,534 | 5,661,855,000 | ... |
| | **Total United States** | | 807,320 | ... | 7,366,303 | 166,283,682,000 | |

*Discovery date indicates first year of production in state. There are 32,975 oil fields in the U.S.

## VENEZUELA

| | Name of field, discovery date | Depth, ft | No. of wells<br>Producing | No. of wells<br>Total | Production<br>1990 average b/d | Production<br>Cumulative to Dec. 31, 1990 bbl | °API gravity |
|---|---|---|---|---|---|---|---|
| **PDVSA/ ZULIA** | Alturitas | ... | 8 | 16 | 2,642 | 4,140,418 | 32.2 |
| | Bachaquero, 1930 | 10,720 | 1,302 | 1,507 | 245,929 | 6,631,194,318 | 22.9 |
| | Barua, 1920 | ... | 11 | 19 | 1,091 | 31,975,134 | 20.8 |
| | Boscan, 1946 | 9,708 | 423 | 695 | 28,851 | 803,178,000 | 10.2 |
| | Cabimas, 1917 | 2,200 | 151 | 832 | 46,880 | 757,784,958 | 22.4 |
| | Centro, 1959 | 9,600-11,000 | 27 | 62 | 148,065 | 991,944,863 | 33.6 |
| | Ceuta | 16,380 | 128 | 284 | 63,957 | 500,636,876 | 30.2 |
| | Cruces-Manueles, 1916 | 3,000-8,000 | 41 | 193 | 1,638 | 177,887,841 | 30.2 |
| | La Concepcion, 1953 | 3,148-8,000 | 50 | 189 | 7,693 | 139,718,456 | 30.1 |
| | La Paz, 1925 | 4,268-8,000 | 52 | 195 | 9,252 | 865,729,055 | 30.1 |
| | Lago, 1959 | 11,450 | 31 | 104 | 17,024 | 274,661,452 | 30.5 |
| | Lagunillas, 1926 | 3,000 | 1,737 | 2,236 | 361,093 | 11,096,650,262 | 22.0 |
| | Lama, 1957 | 8,320 | 201 | 376 | 135,629 | 7,679,286,645 | 32.2 |
| | Lamar, 1958 | 13,000 | 75 | 161 | 81,396 | 1,192,397,969 | 33.5 |
| | Mara, 1945 | 5,240 | 49 | 123 | 5,804 | 417,706,447 | 26.8 |
| | Mene Grande, 1914 | 4,130 | 184 | 779 | 340 | 637,755,243 | 19.9 |
| | Motatan, 1952 | ... | 24 | 37 | 48,614 | 118,241,052 | 22.0 |
| | Sibucara, 1948 | 13,460 | 1 | 3 | 461 | 43,586,251 | ... |
| | Sur del Lago | 17,830 | ... | ... | 15,000 | 23,365,201 | 33.8 |
| | Tia Juana, 1928 | 3,000 | 1,869 | 2,194 | 141,300 | 4,110,081,045 | 17.9 |
| | Urdaneta, 1970 | 10,000 | 2 | 3 | 42,389 | 168,221,172 | 22.0 |
| | West-Tarra, 1942 | 4,250-5,500 | 14 | 46 | 2,128 | 74,780,333 | 30.2 |

WORLDWIDE PRODUCTION

| | | Name of field, discovery date | Depth, ft | No. of wells | | Production | | °API gravity |
|---|---|---|---|---|---|---|---|---|
| | | | | Producing | Total | 1990 average b/d | Cumulative to Dec. 31, 1990 bbl | |
| | **PDVSA/ ANZOA- TEGUI** | Adjuntas, 1957 | 5,000 | ... | ... | ... | 8,714,849 | 13.9 |
| | | Arecuna | 1,300 | 69 | 121 | 4,955 | 12,806,234 | 11.0 |
| | | Bare | 1,110 | 198 | 261 | 30,586 | 37,140,022 | 10.2 |
| | | Boca, 1971 | 9,500 | 7 | 63 | 697 | 9,269,018 | 32.2 |
| | | Caico Seco, 1946 | 6,500-7,300 | 1 | 16 | 243 | 35,541,370 | 31.8 |
| | | Chimire, 1948 | 7,000-7,200 | 17 | 89 | 2,550 | 301,060,007 | 31.1 |
| | | Dacion, 1957 | 6,700 | 79 | 155 | 8,179 | 232,212,117 | 23.0 |
| | | El Roble, 1939 | 3,500-11,500 | 26 | 70 | 2,081 | 43,867,479 | 49.3 |
| | | El Toco | 2,300 | 30 | 47 | 1,437 | 16,046,619 | 23.7 |
| | | Elias, 1954 | 5,000-6,470 | 40 | 140 | 6,168 | ... | ... |
| | | Guara, 1946 | 5,000-10,000 | 97 | 276 | 11,262 | 260,716,726 | 27.0 |
| | | Guario, 1940 | 3,400 | 17 | 63 | 1,598 | 54,913,244 | 43.6 |
| | | Guico, 1944 | 4,500-7,000 | 14 | 67 | 1,450 | 68,308,067 | 25.4 |
| | | Inca, 1948 | 7,250 | 1 | 10 | 4,328 | 62,307,133 | 28.2 |
| | | Isla, 1954 | ... | 23 | 74 | ... | ... | 40.5 |
| | | La Ceiba, 1946 | 9,450 | 20 | 39 | 2,223 | 50,547,336 | 41.9 |
| | | La Ceibita, 1963 | 9,878 | 18 | 57 | 1,816 | 83,981,042 | 42.0 |
| | | Leona, 1938 | 2,200-12,800 | 12 | 77 | 1,089 | 52,278,878 | 26.7 |
| | | Mata, 1954 | 8,970-10,516 | 51 | 410 | 7,166 | 474,216,931 | 35.9 |
| | | Merey, 1937 | 5,400-5,700 | 20 | 47 | 1,061 | 35,459,301 | 12.5 |
| | | Nipa, 1945 | 6,000-6,500 | 18 | 133 | 2,288 | 201,028,306 | 29.6 |
| | | Oficina, 1937 | 5,900 | 39 | 195 | 717 | 383,319,066 | 26.1 |
| | | Oscurote-Norte, 1952 | 9,513 | 12 | 83 | 1,473 | 113,562,318 | 24.2 |
| | | Pato Este, 1988 | ... | 1 | 1 | 69 | 163,836 | 41.9 |
| | | San Joaquin, 1939 | 6,550 | 74 | 135 | 4,766 | 99,299,657 | 51.3 |
| | | Soto, 1950 | 9,500 | 14 | 103 | 766 | 94,229,440 | ... |
| | | Sta. Ana, 1936 | 8,500 | 38 | 116 | 4,641 | 125,644,217 | 45.6 |
| | | Sta. Rosa, 1941 | 8,500 | 152 | 250 | 8,453 | 391,896,543 | 45.7 |
| | | Yopales, 1937 | 4,600 | 102 | 245 | 9,328 | 136,654,306 | 22.6 |
| | | Zanjas, 1958 | 13,270 | 9 | 20 | 1,668 | 41,350,164 | 38.1 |
| | | Zapatos, 1955 | 11,500 | 14 | 71 | 3,022 | 182,354,036 | 32.4 |
| | | Zorro, 1953 | 11,100 | 10 | 34 | 1,261 | 75,106,565 | 29.3 |
| | | Zulus, 1957 | 12,710 | 8 | 28 | 1,183 | 25,413,648 | 41.2 |
| | | Zumo, 1954 | 9,200 | 7 | 39 | 953 | 70,983,494 | 25.3 |
| | **PDVSA/MONAGAS** | Acema, 1960 | ... | 58 | 136 | 11,618 | 61,638,039 | 26.4 |
| | | Acema-Casma | 4,023 | 13 | 24 | 11,256 | 89,426,639 | 24.3 |
| | | Aguasay, 1955 | 8,100-13,400 | 10 | 60 | 2,658 | 100,281,653 | 41.3 |
| | | Aguasay Norte/Sur, 1955 | 4,849 | 8 | 24 | 1,002 | 23,765,381 | 42.4 |
| | | Carisito, 1984 | 4,881 | 7 | 8 | 3,791 | 7,682,047 | 41.7 |
| | | Carito, 1988 | ... | 11 | 12 | 53,826 | 33,390,636 | 31.4 |
| | | Cerro Negro | 1,200 | 18 | 143 | 5,233 | 26,650,628 | 9.0 |
| | | Furrial, 1986 | ... | 4 | 4 | 132,946 | 129,633,355 | 26.3 |
| | | Jobo, 1956 | 3,600-4,000 | 137 | 472 | 21,185 | 290,626,707 | 10.3 |
| | | Jusepin, 1938 | 4,253 | 3 | 463 | 15,695 | 203,577,118 | 26.5 |
| | | Manresa, 1954 | ... | ... | 14 | ... | ... | 16.7 |
| | | Mata Acema, 1951 | ... | ... | ... | 4,891 | 89,426,639 | 27.0 |
| | | Morichal, 1958 | 3,312 | 46 | 262 | 3,569 | 173,632,723 | 9.2 |
| | | Musipan, 1985 | 16,500 | 13 | 14 | 49,180 | 116,836,367 | 32.0 |
| | | Onado, 1971 | 4,791 | 5 | 26 | 961 | 20,705,619 | 28.0 |
| | | Oritupano, 1950 | 7,657 | 16 | 69 | 2,877 | 39,831,574 | 18.4 |
| | | Oritupano Norte/Sur, 1964 | ... | 26 | 171 | 5,161 | 121,968,030 | 24.1 |
| | | Orocual, 1953 | 2,964 | 10 | 82 | 1,052 | 31,228,156 | 25.1 |
| | | Pilon, 1937 | ... | 49 | 149 | 8,152 | 159,555,062 | 11.6 |
| | | Pirital, 1958 | 450-1,100 | 93 | 93 | 75,439 | 27,536,136 | ... |
| | | Quiriquire, 1928 | 7,000-7,200 | ... | ... | 1,075 | 761,894,061 | 27.7 |
| | | Sta. Barbara, 1941 | 5,020-6,500 | 2 | 375 | 29,542 | 164,751,780 | 31.4 |
| | | Tacat, 1953 | 1,820-3,670 | ... | 140 | ... | 45,743,457 | ... |
| | | Temblador, 1936 | 3,500-4,500 | 11 | 139 | 1,299 | 110,095,951 | 18.7 |
| | **PDVSA/BARINAS** | Guafita, 1984 | 8,500 | 28 | 28 | 45,980 | 96,703,909 | 29.1 |
| | | Hato, 1985 | 9,550 | 11 | 18 | 2,444 | 45,416,992 | 22.7 |
| | | La Victoria, 1987 | ... | 12 | 12 | 25,845 | 15,466,832 | 34.5 |
| | | Maporal, 1957 | 10,950 | 11 | 16 | 2,392 | 18,014,999 | 25.7 |
| | | Paez, 1963 | ... | 40 | 67 | 7,880 | 89,765,021 | 19.9 |
| | | Silvan, 1949 | 10,860 | 17 | 22 | 2,286 | 51,672,015 | 26.8 |
| | | Silvestre, 1948 | 8,860 | 20 | 57 | 3,030 | 139,486,891 | 22.1 |
| | | Sinco, 1953 | 8,500-9,100 | 41 | 87 | 6,404 | 264,663,626 | 21.5 |
| | | Other | ... | 4 | 5 | 247 | 3,518,121 | ... |
| | **PDVSA/GUARICO** | Barzo, 1959 | ... | 3 | 6 | 184 | 2,456,211 | 24.0 |
| | | Budare, 1958 | 4,523 | 26 | 50 | 8,503 | 75,378,636 | 31.1 |
| | | Jobal, 1980 | ... | 8 | 14 | 129 | 2,247,025 | 33.6 |
| | | Las Mercedes, 1942 | 4,500 | ... | 265 | ... | 91,650,707 | ... |
| | | Ruiz, 1949 | 4,500 | ... | 67 | ... | 33,109,614 | ... |
| | | Saban, 1947 | ... | 9 | 98 | 181 | 22,306,002 | 43.9 |
| | **PDVSA/AMACURO** | Tucupita, 1946 | ... | ... | 48 | ... | 67,074,199 | ... |
| | **PDVSA/FALCON** | All fields, 1920 | ... | ... | ... | ... | 108,212,457 | 27.4 |
| | | Total Venezuela | | 6,426 | 17,368 | 2,084,838 | 44,391,484,376 | |
| **YEMEN** | **HUNT OIL** | Al-Shura, 1989 | 7,600 | 3 | 4 | 2,000 | 756,000 | 40.0 |
| | | Alif, 1984 | 5,750 | 54 | 96 | 154,400 | 178,445,000 | 40.0 |
| | | Al-Windah, 1989 | 7,500 | 1 | 1 | ... | 16,000 | 40.0 |

WORLDWIDE PRODUCTION

| | | Name of field, discovery date | Depth, ft | No. of wells<br>Producing | No. of wells<br>Total | Production<br>1980 average b/d | Production<br>Cumulative to Dec. 31, 1980 bbl | °API gravity |
|---|---|---|---|---|---|---|---|---|
| | | Asa'ad Al-Kamil, 1987 | 6,100 | 17 | 31 | 10,100 | 3,685,000 | 40.0 |
| | | Azal, 1987 | 6,850 | 10 | 16 | 20,600 | 21,513,000 | 40.0 |
| | | Jabal, Nuqum, 1988 | 3,780 | 1 | 1 | 1,100 | 861,000 | 44.0 |
| | | Saif Ben The-Yazan, 1988 | 7,600 | 1 | 2 | 1,100 | 862,000 | 40.0 |
| | | **Total Yemen** | | **87** | **181** | **188,300** | **204,158,000** | |
| **YUGOSLAVIA** | INA-NAFTAPLIN | Beničanci, 1966 | 6,752-5,936 | 25 | 27 | 3,978 | 105,524,222 | 30.2 |
| | | Bilogora, 1966 | 3,346-5,052 | 37 | 50 | 680 | 8,607,666 | 40.8 |
| | | Bizovac, 1969 | 5,483-5,499 | 2 | 7 | 223 | 113,844 | 33.8 |
| | | Bokšić-Klokočevci, 1975 | 7,218-10,171 | 8 | 9 | 61 | 257,280 | 31.0 |
| | | Bunjani, 1951 | 1,800-2,550 | 21 | 27 | 91 | 2,547,471 | 30.2 |
| | | Crnac, 1977 | 6,814-8,061 | 2 | 2 | 83 | 175,702 | 34.6 |
| | | Deletovci, 1982 | 3,143-3,422 | 46 | 47 | 3,512 | 7,462,429 | 28.9 |
| | | Dugo Selo, 1953 | 3,445-4,183 | 15 | 16 | 422 | 9,935,794 | 31.1 |
| | | Ferdinandovac, 1959 | 5,625-5,915 | 5 | 6 | 104 | 1,325,177 | 36.0 |
| | | Ilača, 1982 | 3,445-3,855 | 10 | 15 | 265 | 504,163 | 31.1 |
| | | Ivanić Grad, 1959 | 5,282-5,709 | 46 | 47 | 3,415 | 45,396,388 | 33.4 |
| | | Jagnjedovac, 1961 | 2,864-3,570 | 25 | 30 | 414 | 6,550,917 | 33.0 |
| | | Jamarice, 1965 | 3,281-5,512 | 88 | 103 | 2,564 | 16,164,824 | 37.6 |
| | | Ježevo, 1963 | 6,234-7,382 | 8 | 11 | 82 | 889,573 | 36.7 |
| | | Kalinovac[c], 1978 | 11,841-14,682 | 18 | 19 | 6,982 | 7,800,225 | 51.5 |
| | | Kloštar, 1952 | 2,297-4,593 | 74 | 82 | 968 | 40,777,483 | 36.3 |
| | | Kozarice, 1972 | 3,281-3,609 | 19 | 20 | 401 | 1,779,235 | 23.6 |
| | | Križ, 1948 | 1,600-2,250 | 30 | 50 | 89 | 6,527,336 | 17.4 |
| | | Kučanci-Kapelna, 1973 | 6,562-7,218 | 14 | 17 | 1,033 | 1,755,354 | 25.2 |
| | | Lacići, 1979 | 7,605-8,012 | 7 | 9 | 2,000 | 5,073,212 | 36.6 |
| | | Lepavina, 1969 | 1,780-2,200 | 8 | 8 | 224 | 920,587 | 22.8 |
| | | Letičani, 1969 | 4,584-4,817 | 5 | 5 | 135 | 88,875 | 35.0 |
| | | Lipovljani, 1960 | 3,937-5,709 | 64 | 90 | 2,055 | 22,897,611 | 36.7 |
| | | Lupoglav, 1971 | 3,860-5,600 | 5 | 5 | 100 | 176,762 | 33.4 |
| | | Mihovljani, 1973 | 5,150-5,760 | 4 | 4 | 84 | 89,797 | 32.5 |
| | | Molve,[c] 1974 | 10,263-11,345 | 17 | 20 | 958 | 2,528,703 | 57.2 |
| | | Mramor Brdo, 1949 | 2,625-4,101 | 4 | 4 | 38 | 4,563,612 | 31.1 |
| | | Obod, 1967 | 6,378-7,550 | 1 | 8 | 165 | 2,284,463 | 32.5 |
| | | Okoli, 1962 | 7,362-8,366 | 4 | 4 | 375 | 675,904 | 35.5 |
| | | Okoli,[c] 1962 | 7,218-7,874 | 10 | 15 | 505 | 1,014,940 | 80.6 |
| | | Privlaka, 1983 | 2,933-3,041 | 13 | 17 | 1,124 | 1,793,385 | 25.9 |
| | | Sandrovac, 1962 | 2,250-3,700 | 99 | 156 | 3,972 | 39,416,887 | 37.8 |
| | | Stari Gradec[c], 1980 | 11,720-13,630 | 3 | 7 | 752 | 689,322 | 51.4 |
| | | Števkovica, 1978 | 7,710-9,843 | 17 | 25 | 791 | 4,165,103 | 31.9 |
| | | Struzec, 1956 | 2,362-3,773 | 60 | 81 | 5,386 | 103,267,756 | 38.8 |
| | | Vezišće, 1965 | 6,135-6,562 | 5 | 5 | 18 | 54,667 | 31.6 |
| | | Žutica, 1963 | 5,742-6,923 | 167 | 173 | 6,941 | 96,564,037 | 33.8 |
| | | Other,[c] | 5,250-11,800 | 17 | 21 | 231 | 664,136 | 87.9 |
| | NAFTA-GAS[e] | Boka, 1956 | 3,969-4,100 | 25 | 43 | | | 32.7 |
| | | Čoka, 1975 | 4,888-5,046 | 9 | 23 | | | 44.3 |
| | | Elemir, 1959 | 5,002-5,376 | 29 | 63 | | | 32.7 |
| | | Ilebej, 1978 | 6,973-7,327 | 5 | 16 | | | 26.4 |
| | | Janošik, 1958 | 2,148-3,293 | 1 | 4 | | | 24.2 |
| | | Jermenovci, 1952 | 2,919-3,148 | 56 | 100 | | | 24.2 |
| | | Karadjordjevo, 1973 | 6,308-8,846 | 6 | 22 | | | 26.4 |
| | | Kelebija, 1970 | 2,061-2,788 | 12 | 28 | | | 21.2 |
| | | Kikinda, 1960 | 3,543-5,735 | 166 | 229 | 12,690 | 187,429,500 | 34.9 |
| | | Kikinda-varoš, 1983 | 3,740-6,490 | 50 | 69 | | | 27.9 |
| | | Lokve, 1953 | 2,909-3,090 | 9 | 26 | | | 25.1 |
| | | Morkrin, 1961 | 6,232-7,216 | 105 | 186 | | | 36.1 |
| | | Mokrin-jug, 1982 | 6,658-6,740 | 16 | 23 | | | 41.1 |
| | | Mejdan, 1972 | 7,706-7,790 | 14 | 29 | | | 37.4 |
| | | Palić, 1968 | 3,345-3,427 | 6 | 34 | | | 45.9 |
| | | V. Greda-jug, 1981 | 3,237-3,427 | 10 | 22 | | | 23.8 |
| | | Velebit, 1965 | 2,434-2,575 | 122 | 159 | | | 22.8 |
| | | Zrenjanin, 1974 | 6,829-6,966 | 5 | 11 | | | 25.0 |
| | | **Total Yugoslavia** | | **1,846** | **2,358** | **63,910** | **729,455,142** | |
| **ZAIRE** | CHEVRON | ● GCO, 1970 | 7,000-9,000 | 5 | 13 | 174 | 8,456,377 | 38.7 |
| | | ● Libwa, 1981 | 5,500 | 3 | 3 | 1,563 | 565,157 | 33.0 |
| | | ● Lukami, 1983 | 12,400 | 6 | 9 | 1,393 | 7,905,246 | 33.2 |
| | | ● Mibale, 1973 | 5,000-6,000 | 5 | 5 | 9,176 | 82,349,447 | 30.0 |
| | | ● Motoba, 1976 | 11,098 | 9 | 9 | 7,383 | 8,215,914 | 31.5 |
| | | ● Mwambe, 1979 | 6,150 | 1 | 2 | 156 | 795,966 | 29.7 |
| | | ● Moko, 1972 | 12,310 | 1 | 1 | 424 | 154,253 | 32.0 |
| | ZAIREP (FINA) | East Mibale, 1978 | 6,000 | ... | 1 | ... | 387,000 | 34.0 |
| | | Kifuku, 1983 | 3,400 | 1 | 1 | 14 | 56,088 | 31.0 |
| | | Kinkasi, 1972 | 3,700 | 41 | 42 | 2,178 | 8,975,168 | 31.0 |
| | | Liawenda, 1972 | 3,900 | 30 | 36 | 1,553 | 4,586,861 | 31.0 |
| | | Makelekese, 1983 | 3,600 | 8 | 8 | 368 | 10,490,938 | 31.0 |
| | | Muanda, 1972 | 3,600 | 6 | 7 | 340 | 948,495 | 31.0 |
| | | Nsiamfumu, 1977 | 8,300 | ... | 1 | ... | 5,000 | 34.0 |
| | | Tshiende, 1978 | 6,000 | 5 | 8 | 4,397 | 9,312,309 | 34.0 |
| | | **Total Zaire** | | **121** | **146** | **29,118** | **161,215,839** | |

## U.S. fields with oil reserves exceeding 100 million bbl

| State Field Disc. year | 1991 prod. | Cum prod. 1-1-92 | Est. rem. reserves | Est. No. prod. wells |
|---|---|---|---|---|
| | 1,000 bbl | | | |
| ***ALABAMA*** | | | | |
| Citronelle, 1955 | 1,520 | 152,762 | 8,550 | 440 |
| ***ALASKA*** | | | | |
| ●Endicott, 1978 | 41,153 | 161,236 | 214,107 | 56 |
| ●Granite Point, 1965 | 2,075 | 115,345 | 13,392 | 27 |
| Kuparuk River, 1969 | 112,223 | 837,491 | §1,063,748 | 341 |
| Lisburne, 1967 | 13,558 | 77,684 | 132,615 | 71 |
| ●McArthur River, 1965 | 7,200 | 547,298 | 28,360 | 81 |
| ●Middle Ground Shoal, 1962 | 2,648 | 164,303 | 2,173 | 44 |
| Prudhoe Bay, 1968 | *473,165 | †7,551,472 | §4,448,528 | 855 |
| Swanson River, 1957 | 1,966 | 215,158 | 4,182 | 29 |

*Includes 42.17 million bbl of condensate. †Includes 243.34 million bbl of condensate. §Estimate of ultimate recovery increased in 1991.

| State Field Disc. year | 1991 prod. | Cum prod. 1-1-92 | Est. rem. reserves | Est. No. prod. wells |
|---|---|---|---|---|
| ***ARKANSAS*** | | | | |
| Magnolia, 1938 | 500 | 163,190 | 5,228 | 56 |
| Smackover, 1922 | 2,007 | 563,913 | 3,701 | 1,573 |
| ***CALIFORNIA*** | | | | |
| **San Joaquin Valley** | | | | |
| Belridge South, 1911 | 55,899 | 847,388 | 264,981 | 5,176 |
| Buena Vista, 1909 | 1,525 | 651,971 | 22,205 | 808 |
| Coalinga, 1890 | 12,472 | 788.046 | 117,625 | 2,109 |
| Coalinga Nose, 1938 | 700 | 501,363 | 6,751 | 74 |
| Coles Levee North, 1938 | 337 | 161,627 | 3,046 | 69 |
| Cuyama South, 1949 | 383 | 219,424 | 5,705 | 94 |
| Cymric, 1909 | 10,448 | 228,599 | 66,361 | 1,039 |
| Edison, 1928 | 1,044 | 137,573 | 16,459 | 656 |
| Elk Hills, 1911 | 26,358 | 985,340 | 516,752 | 1,045 |
| Fruitvale, 1928 | 525 | 117,036 | 12,226 | 231 |
| Greeley, 1936 | 212 | 113,176 | 1,234 | 23 |
| Kern Front, 1912 | 2,721 | 179,438 | 48,858 | 845 |
| Kern River, 1899 | 44,874 | 1,339,460 | 606,192 | 7,260 |
| Kettleman North Dome, 1928 | 169 | 457,167 | 779 | 45 |
| Lost Hills, 1910 | 8,024 | 198,812 | 117,618 | 1,916 |
| McKittrick, 1896 | 1,542 | 272,415 | 85,326 | 730 |
| Midway-Sunset, 1894 | 61,454 | 2,056,855 | 695,502 | 10,720 |
| Mount Poso, 1926 | 5,110 | 280,182 | 62,348 | 572 |
| Rio Bravo, 1937 | 51 | 116,271 | 456 | 8 |
| Yowlumne, 1974 | 3,911 | 96,023 | 13,288 | 64 |
| **Coastal Area** | | | | |
| ●Carpinteria, 1966 | 1,569 | 93,339 | 24,388 | 110 |
| Cat Canyon E. & W., 1908 | 1,222 | 292,943 | 27,981 | 379 |
| ●Dos Cuadras, 1969 | 3,263 | 223,655 | 43,289 | 94 |
| ●Elwood, 1928 | 163 | 106,369 | 1,619 | 7 |
| ●Hondo, 1969 | 8,222 | 115,220 | 85,381 | 21 |
| Orcutt, 1901 | 816 | 168,342 | 10,697 | 139 |
| ●Point Arguello, 1981* | 4,620 | 4,620 | †— | 16 |
| ●Point Pedernales, 1982§ | 4,644 | 28,807 | 43,676 | 11 |
| ●Rincon, 1927 | 931 | 151,765 | 13,164 | 177 |
| San Ardo, 1947 | 3,843 | 419,881 | 111,373 | 480 |
| Santa Maria Valley, 1934 | 910 | 201,545 | 17,199 | 124 |
| South Mountain, 1916 | 720 | 148,116 | 9,903 | 359 |
| Ventura, 1919 | 6,365 | 914,434 | 86,825 | 525 |
| **Los Angeles basin** | | | | |
| ●Beta, 1976 | 4,589 | 55,190 | 75,767 | 65 |
| Beverly Hills, 1900 | 1,676 | 128,005 | 36,967 | 89 |
| Brea-Olinda, 1880 | 1,717 | 389,749 | 48,932 | 724 |
| Coyote East, 1909 | 556 | 110,322 | 11,553 | 63 |
| Coyote West, 1909 | 464 | 251,748 | 5,702 | 59 |
| Dominguez, 1923 | 577 | 270,996 | 5,718 | 103 |
| ●Huntington Beach, 1920 | 3,869 | 1,079,189 | 59,223 | 464 |
| Inglewood, 1924 | 2,186 | 352,720 | 46,882 | 253 |
| ●Long Beach, 1921 | 2,000 | 916,172 | 10,801 | 366 |
| Montebello, 1917 | 503 | 194,023 | 8,601 | 114 |
| Richfield, 1919 | 1,054 | 192,791 | 23,786 | 192 |
| Santa Fe Springs, 1919 | 868 | 615,928 | 17,511 | 136 |
| ●Seal Beach, 1924 | 703 | 205,344 | 11,892 | 161 |
| ●Torrance, 1922 | 1,258 | 216,115 | 31,815 | 277 |
| ●Wilmington, 1932 | 24,902 | 2,369,886 | 417,976 | 1,658 |

*Production started up in June 1991. †Reserves estimated at 300-500 million bbl.

§Revised to reflect only developed portion of field. Original estimate of total field reserves is 350 million bbl.

| State Field Disc. year | 1991 prod. | Cum prod. 1-1-92 | Est. rem. reserves | Est. No. prod. wells |
|---|---|---|---|---|
| ***COLORADO*** | | | | |
| Rangely, 1933 | 12,611 | 776,846 | 127,154 | 507 |
| ***FLORIDA*** | | | | |
| Jay, 1970 | 2,010 | 371,032 | 25,524 | 55 |
| ***ILLINOIS*** | | | | |
| Clay City, 1938 | 2,055 | 400,364 | 1,704 | 762 |
| Dale Consolidated, 1940 | 149 | 104,895 | 1,298 | 101 |
| Lawrence, 1906 | 2,490 | 402,340 | 4,547 | 288 |
| Louden, 1938 | 844 | 391,195 | 6,212 | 271 |
| Main, 1906 | 1,787 | 238,987 | 2,536 | 541 |
| New Harmony, 1938 | 815 | 156,207 | 2,686 | 166 |
| Salem, 1938 | 880 | 229,183 | 2,429 | 31 |
| ***KANSAS*** | | | | |
| Bemis-Shutts, 1928 | 1,166 | 247,650 | 7,909 | 721 |
| Chase-Silica, 1931 | 895 | 304,793 | 3,745 | 685 |
| El Dorado, 1917 | 878 | 301,190 | 4,624 | 718 |
| Hall-Gurney, 1931 | 960 | 149,118 | 5,420 | 800 |
| Kraft-Prusa, 1937 | 470 | 129,390 | 3,093 | 390 |
| Trapp, 1937 | 999 | 229,545 | 7,478 | 686 |
| ***LOUISIANA*** | | | | |
| **Offshore** | | | | |
| ●Bay Marchand Block 2, 1949 | 10,019 | 625,999 | 30,273 | 213 |
| ●Breton Sound Block 20, 1953 | 2,555 | 97,202 | 22,811 | 89 |
| ●Eugene Island Block 175, 1956 | 1,302 | 72,850 | 35,313 | 26 |
| ●Eugene Island Block 276, 1964 | 1,260 | 75,726 | 26,004 | 38 |
| ●Eugene Island Block 330, 1971 | 5,250 | 288,543 | 36,455 | 105 |
| ●Grand Isle Block 16, 1948 | 2,214 | 272,441 | 76,933 | 45 |
| ●Grand Isle Block 43, 1956 | 3,191 | 284,060 | 73,884 | 81 |
| ●Grand Isle Block 47, 1955 | 2,005 | 84,901 | 31,540 | 41 |
| ●Main Pass Block 35, 1951 | 425 | 96,271 | 4,002 | 45 |
| ●Main Pass Block 41, 1957 | 1,901 | 244,985 | 16,253 | 68 |
| ●Main Pass Block 69, 1948 | 2,214 | 246,331 | 14,116 | 97 |
| ●Main Pass Block 306, 1969 | 901 | 205,622 | 7,218 | 59 |
| ●Mississippi Canyon Block 194 (Cognac), 1980 | 8,155 | 128,525 | — | 32 |
| ●Ship Shoal Block 207, 1967 | 740 | 90,204 | 10,612 | 22 |
| ●Ship Shoal Block 208, 1962 | 2,535 | 168,975 | 18,787 | 40 |
| ●South Marsh Island Block 128, 1974 | 3,281 | 100,172 | 17,670 | 41 |
| ●South Marsh Island Block 130, 1975 | 5,387 | 145,649 | 30,910 | 82 |
| ●South Pass Block 24, 1950 | 1,615 | 260,351 | 15,965 | 166 |
| ●South Pass Block 27, 1954 | 1,755 | 135,151 | 11,645 | 178 |
| ●South Pass Block 61, 1968 | 6,325 | 171,441 | 28,966 | 156 |
| ●South Pass Block 62, 1965 | 2,150 | 113,255 | 24,703 | 68 |
| ●South Pass Block 65, 1965 | 2,376 | 109,231 | 18,950 | 55 |
| ●South Pass Block 89, 1969 | 645 | 98,864 | 4,211 | 149 |
| ●South Timbalier Block 21, 1939 | 1,950 | 222,287 | 13,805 | 44 |
| ●South Timbalier Block 135, 1956 | 714 | 142,551 | 8,156 | 25 |
| ●West Delta Block 30, 1949 | 5,315 | 462,749 | 30,706 | 131 |
| ●West Delta Block 73, 1962 | 6,200 | 201,616 | 73,375 | 76 |
| ●West Delta Block 79, 1966 | 2,890 | 138,175 | 22,760 | 62 |
| **Onshore South** | | | | |
| Avery Island, 1942 | 910 | 94,827 | 4,277 | 16 |
| Bay de Chene, 1941 | 241 | 97,335 | 5,614 | 20 |
| Bay St. Elaine, 1928 | 232 | 165,853 | 2,476 | 16 |
| Bayou Sale, 1941 | 310 | 162,827 | 1,959 | 16 |
| Black Bay West, 1953 | 1,650 | 150,535 | 8,918 | 67 |
| Caillou Island, 1930 | 1,694 | 608 334 | 7,940 | 121 |
| Cote Blanche Bay West, 1940 | 775 | 184,471 | 43,497 | 90 |
| Cote Blanche Island, 1948 | 589 | 184,285 | 2,281 | 90 |
| Delta Farms, 1944 | 675 | 117,165 | 5,205 | 33 |
| Garden Island Bay, 1934 | 714 | 224,001 | 6,227 | 78 |
| Golden Meadow, 1938 | 480 | 137,138 | 2,591 | 131 |
| Grand Bay, 1938 | 625 | 172,207 | 4,614 | 70 |
| Hackberry, East, 1927 | 489 | 110,586 | 6,104 | 51 |
| Hackberry, West, 1928 | 895 | 145,437 | 3,872 | 107 |
| Iberia, 1917 | 555 | 96,862 | 3,119 | 49 |
| Iowa, 1931 | 80 | 99,619 | 381 | 15 |
| Jennings, 1901 | 212 | 117,112 | 1,396 | 176 |
| Lafitte, 1935 | 1,009 | 258,847 | 6,007 | 99 |
| Lake Barre, 1929 | 812 | 206,773 | 17,311 | 26 |
| Lake Pelto, 1929 | 301 | 118,228 | 16,187 | 16 |
| Lake Washington, 1931 | 1,972 | 249,257 | 9,509 | 80 |
| Leeville, 1931 | 480 | 143,236 | 5,631 | 37 |
| Paradis, 1939 | 475 | 128,347 | 6,903 | 29 |
| Quarantine Bay, 1937 | 695 | 174,928 | 13,500 | 27 |
| Romere Pass, 1950 | 514 | 98,226 | 3,015 | 32 |
| Timbalier Bay, 1938 onshore | 525 | 298,244 | 22,097 | 64 |
| Venice, 1937 | 555 | 183,936 | 5,532 | 40 |
| Vinton, 1910 | 295 | 161,925 | 1,576 | 96 |
| Weeks Island, 1945 | 895 | 228,916 | 18,379 | 16 |
| West Bay, 1940 | 709 | 230,985 | 13,616 | 58 |
| White Castle, 1929 | 1,159 | 91,354 | 8,772 | 48 |
| North | | | | |
| Caddo-Pine Island, 1905 | 2,356 | 369,514 | 11,995 | 11,352 |
| Delhi, 1944 | 330 | 212,999 | 3,359 | 54 |
| Haynesville, 1921 | 1,510 | 171,626 | 9,114 | 131 |
| Homer, 1919 | 347 | 99,520 | 1,993 | 173 |
| Rodessa, 1935 | 330 | 107,117 | 2,129 | 78 |

## U.S. fields with oil reserves exceeding 100 million bbl (continued)

| State Field Disc. year | 1991 prod. | Cum prod. 1-1-92 | Est. rem. reserves | Est. No. prod. wells |
|---|---|---|---|---|
| | 1,000 bbl | 1,000 bbl | 1,000 bbl | |
| ***MICHIGAN*** | | | | |
| Albion-Pulaski-Scipio, 1957 | 29 | >132,202 | 9,928 | 330 |
| ***MISSISSIPPI*** | | | | |
| Baxterville, 1944 | 1,810 | 245,284 | 12,595 | 185 |
| Heidelberg, 1944 | 2,359 | 182,079 | 11,722 | 209 |
| Tinsley, 1939 | 611 | 221,629 | 3,874 | 98 |
| ***MONTANA*** | | | | |
| Bell Creek, 1967 | 455 | 131,153 | 2,553 | 69 |
| Cabin Creek, 1953 | 1,162 | 93,935 | 7,592 | 92 |
| Cut Bank, 1926 | 787 | 164,763 | 4,804 | 536 |
| Elk Basin, 1915 | 562 | 96,832 | 3,253 | 45 |
| Pine, 1951 | 1,160 | 108,821 | 6,218 | 100 |
| ***NEW MEXICO*** | | | | |
| Denton, 1949 | 770 | 141,140 | 4,223 | 77 |
| Empire-Abo, 1957 | 1,005 | 223,782 | 6,218 | 240 |
| Eunice-Monument, 1929 | 2,133 | 132,736 | 10,675 | 494 |
| Hobbs, 1928 | 5,327 | 316,109 | 27,823 | 340 |
| Maljamar, 1926 | 1,503 | 149,911 | 9,952 | 518 |
| Vacuum, 1929 | 8,408 | 460,314 | 42,611 | 696 |
| ***NORTH DAKOTA*** | | | | |
| Beaver Lodge, 1951 | 1,498 | 116,122 | 12,034 | 62 |
| ***OKLAHOMA*** | | | | |
| Bowlegs, 1927 | 160 | 162,987 | 1,820 | 114 |
| Burbank, 1920 | 852 | 539,392 | 5,731 | 933 |
| Cement, 1917 | 1,201 | 134,792 | 7,802 | 843 |
| Earlsboro, 1926 | 197 | 202,531 | 1,693 | 78 |
| Eola-Robberson, 1921 | 889 | 135,795 | 5,539 | 365 |
| Fitts, 1933 | 1,999 | 206,954 | 11,976 | 527 |
| Glenn Pool, 1905 | 600 | 330,202 | 4,619 | 485 |
| Golden Trend, 1945 | 3,287 | 484,576 | 20,449 | 1,177 |
| Healdton, 1913 | 1,425 | 339,703 | 10,110 | 922 |
| Hewitt, 1919 | 1,869 | 274,215 | 12,511 | 703 |
| Little River, 1927 | 166 | 141,458 | 1,495 | 73 |
| Oklahoma City, 1928 | 1,040 | 819,385 | 9,750 | 190 |
| Postle, 1960 | 901 | 109,484 | 11,830 | 216 |
| Seminole, 1926 | 289 | 193,712 | 1,643 | 143 |
| Sho-Vel-Tum, 1919 | 15,180 | 1,216,216 | 84,784 | 6,370 |
| Sooner Trend, 1965 | 3,131 | 305,872 | 20,091 | 2,964 |
| St. Louis, 1925 | 859 | 176,871 | 4,065 | 441 |
| ***TEXAS*** | | | | |
| **Dist. 1—Southwest** | | | | |
| Darst Creek, 1929 | 511 | 155,770 | 3,412 | 880 |
| Luling-Branyon, 1922 | 925 | 150,450 | 4,725 | 1,671 |
| Pearsall, 1936 | 20,576 | 113,011 | 39,782 | 1,059 |
| **Dist. 2—Central Gulf Coast** | | | | |
| Greta, 1933 | 413 | 148,971 | 2,511 | 75 |
| Lake Pastura, 1953 | 1,683 | 92,853 | 7,575 | 188 |
| Tom O'Connor, 1934 | 5,319 | 765,414 | 27,367 | 659 |
| West Ranch, 1938 | 1,624 | 385,720 | 7,915 | 235 |
| **Dist. 3—Upper Gulf Coast** | | | | |
| Anahuac, 1935 | 495 | 286,717 | 2,538 | 79 |
| Barbers Hill, 1916 | 309 | 111,942 | 1,895 | 88 |
| Conroe, 1931 | 1,922 | 734,168 | 11,195 | 226 |
| Giddings, 1971 | 12,777 | 293,761 | 55,313 | 2,299 |
| Goose Creek, 1906 | 655 | 119,479 | 3,862 | 193 |
| Hastings East, 1934 | 1,530 | 698,615 | 8,676 | 139 |
| High Island, 1922 | 362 | 136,156 | 1,659 | 95 |
| Hull, 1918 | 425 | 168,842 | 4,076 | 248 |
| Humble, 1905 | 154 | 98,703 | 1,240 | 175 |
| Magnet Withers, 1936 | 1,315 | 115,146 | 8,350 | 142 |
| Manvel, 1931 | 425 | 101,269 | 2,027 | 70 |
| Oyster Bayou, 1941 | 520 | 162,109 | 2,888 | 27 |
| Raccoon Bend, 1927 | 486 | 101,868 | 2,499 | 110 |
| Sour Lake, 1902 | 1,066 | 98,492 | 8,361 | 362 |
| Thompson, 1921 | 1,941 | 480,330 | 12,717 | 176 |
| Tomball, 1933 | 250 | 121,884 | 1,493 | 55 |
| Webster, 1937 | 2,946 | 583,623 | 19,155 | 188 |
| West Columbia, 1917 | 84 | 101,249 | 650 | 38 |
| **Dist. 4—South** | | | | |
| Agua Dulce-Stratton, 1928 | 124 | 147,238 | 2,262 | 58 |
| Borregos, 1945 | 116 | 114,470 | 1,009 | 29 |
| Kelsey, 1938 | 169 | 115,423 | 1,216 | 55 |
| Plymouth, 1925 | 190 | 123,447 | 2,676 | 49 |
| Seeligson, 1925 | 165 | 272,048 | 1,001 | 40 |
| TCB, 1944 | 45 | 113,141 | 500 | 11 |
| White Point, E., 1938 | 101 | 104,349 | 711 | 41 |
| **Dist. 5—East** | | | | |
| Van, 1928 | 2,675 | 530,243 | 13,225 | 485 |
| **Dist. 6—East** | | | | |
| East Texas, 1930 | 33,119 | 5,112,691 | 246,918 | 8,334 |
| Fairway, 1960 | 1,808 | 198,424 | 12,044 | 104 |
| Hawkins, 1940 | 5,411 | 840,127 | 23,889 | 408 |
| Neches, 1953 | 865 | 106,728 | 3,288 | 163 |
| Quitman, 1948 | 1,060 | 124,868 | 4,918 | 157 |
| Talco, 1931 | 2,032 | 278,402 | 15,519 | 484 |
| **Dist. 7B—West Central** | | | | |
| Stephens County Reg., 1916 | 4,915 | 149,340 | 29,215 | 1,051 |
| **Dist. 7C—West Central** | | | | |
| Big Lake, 1923 | 485 | 131,410 | 2,030 | 88 |
| McCamey, 1925 | 295 | 125,117 | 1,496 | 589 |
| Pegasus, 1949 | 817 | 137,631 | 4,319 | 178 |
| **Dist. 8—West** | | | | |
| Andector, 1946 | 487 | 183,559 | 4,829 | 42 |
| Block 31, 1945 | 2,165 | 228,002 | 14,548 | 214 |
| Cowden, N., 1930 | 13,319 | 528,650 | 64,301 | 1,375 |
| Cowden, S.,<br>Foster, Johnson 1930 | 7,794 | 525,892 | 36,717 | 1,569 |
| Dollarhide, 1945 | 2,504 | 201,290 | 13,992 | 238 |
| Dune, 1938 | 2,200 | 189,867 | 11,837 | 694 |
| Fuhrman-Mascho, 1930 | 1,409 | 110,015 | 8,009 | 753 |
| Fullerton, 1942 | 7,413 | 370,669 | 45,833 | 908 |
| Goldsmith, 1934 | 5,278 | 772,793 | 31,616 | 1,393 |
| Hendrick, 1926 | 475 | 253,764 | 2,222 | 185 |
| Howard-Glasscock, 1925 | 5,697 | 420,786 | 27,292 | 2,082 |
| Iatan, E., 1926 | 2,714 | 151,408 | 14,018 | 1,257 |
| Jordan, 1937 | 725 | 131,393 | 4,110 | 222 |
| Kermit, 1928 | 365 | 114,493 | 2,484 | 400 |
| Keystone, 1930 | 1,353 | 317,491 | 6,475 | 641 |
| Mabee, 1943 | 2,214 | 93,835 | 10,712 | 381 |
| McElroy, 1926 | 8,201 | 488,497 | 33,852 | 1,856 |
| Means, 1934 | 5,575 | 246,055 | 24,616 | 701 |
| Midland Farms, 1944 | 2,281 | 250,407 | 10,189 | 281 |
| Penwell, 1926 | 1,830 | 113,706 | 13,655 | 388 |
| Sand Hills, 1931 | 1,925 | 254,544 | 15,263 | 1,123 |
| Shafter Lake, 1947 | 1,123 | 98,741 | 7,914 | 448 |
| TXL, 1944 | 1,311 | 267,793 | 8,492 | 534 |
| Waddell, 1927 | 455 | 102,319 | 4,279 | 183 |
| Ward, S., 1938 | 504 | 106,649 | 3,811 | 630 |
| Ward Estes, N., 1929 | 3,855 | 374,863 | 65,750 | 1,340 |
| Westbrook, 1920 | 1,940 | 94,044 | 9,960 | 545 |
| Yates, 1926 | 19,401 | 1,240,574 | 112,985 | 1,021 |
| **Dist. 8A—West** | | | | |
| Adair, 1947 | 969 | 110,167 | 7,908 | 145 |
| Anton-Irish, 1944 | 2,512 | 184,922 | 15,593 | 242 |
| Cogdell, 1949 | 947 | 295,632 | 7,790 | 184 |
| Diamond M, 1948 | 1,407 | 244,009 | 11,472 | 282 |
| Garza, 1926 | 2,550 | 113,045 | 20,088 | 535 |
| Kelly-Snyder, 1948 | 7,419 | 1,269,443 | 80,557 | 677 |
| Levelland, 1938 | 16,000 | 532,742 | 84,752 | 3,023 |
| Prentice, 1951 | 5,112 | 176,458 | 34,317 | 395 |
| Salt Creek, 1950 | 9,042 | 276,812 | 52,119 | 189 |
| Seminole, 1936 | 16,015 | 573,458 | 94,834 | 454 |
| Slaughter, 1936 | 16,837 | 1,082,143 | 118,958 | 2,575 |
| Spraberry Trend, 1951 | 18,255 | 709,104 | 105,313 | 7,475 |
| Wasson, 1936 | 27,717 | 1,795,359 | 109,638 | 2,273 |
| Welch, 1942 | 2,830 | 153,034 | 23,211 | 779 |
| **Dist. 9—North** | | | | |
| Archer County Reg., 1911 | 1,417 | 182,515 | 7,439 | 4,041 |
| Cooke County Reg., 1926 | 899 | 102,836 | 4,265 | 1,432 |
| K-M-A, 1931 | 890 | 142,296 | 3,991 | 713 |
| Walnut Bend, 1938 | 470 | 124,591 | 2,635 | 142 |
| Wichita County Reg., 1910 | 2,489 | 339,886 | 13,977 | 7,163 |
| Wilbarger County Reg., 1915 | 665 | 147,215 | 3,519 | 1,000 |
| Young County Reg., 1917 | 1,196 | 101,225 | 5,778 | 2,886 |
| **Dist. 10—Panhandle** | | | | |
| Panhandle, 1921 | 6,105 | 1,442,247 | 23,910 | 10,883 |
| ***UTAH*** | | | | |
| Altamont, 1955 | 3,027 | 97,974 | 24,607 | 434 |
| Greater Aneth, 1956 | 5,101 | 370,369 | 27,654 | 464 |
| Bluebell, 1949 | 3,587 | 120,933 | 23,917 | 215 |
| ***WYOMING*** | | | | |
| Byron, 1918 | 770 | 123,214 | 5,071 | 58 |
| Elk Basin, 1915 | 2,409 | 439,854 | 17,762 | 178 |
| Frannie, 1928 | 613 | 118,192 | 2,747 | 64 |
| Garland, 1906 | 2,460 | 170,417 | 11,713 | 234 |
| Grass Creek, 1914 | 1,916 | 191,554 | 11,026 | 243 |
| Hamilton Dome, 1918 | 2,287 | 237,512 | 13,166 | 248 |
| Hartzog Draw, 1976 | 3,969 | 80,892 | 24,232 | 160 |
| Hilight, 1969 | 401 | 76,800 | 4,498 | 92 |
| Lance Creek, 1918 | 140 | 108,219 | 1,356 | 25 |
| Little Buffalo Basin, 1914 | 1,695 | 124,865 | 8,668 | 171 |
| Lost Soldier, 1916 | 4,055 | 218,899 | 35,717 | 91 |
| Oregon Basin, 1912 | 6,712 | 410,351 | 38,176 | 523 |
| Salt Creek, 1889 | 3,815 | 642,406 | 25,610 | 1,014 |
| Steamboat Butte, 1943 | 601 | 91,655 | 10,125 | 37 |
| Wertz, 1921 | 1,804 | 107,871 | 22,674 | 46 |

Sources: OGJ estimates from operator, Petroleum Information Corp., state geological survey, and oil and gas agency data.

•Field partially or wholly offshore

## World gas production (bcf)

| Country | 1991* |
|---|---|
| Argentina | 747.3 |
| Bolivia | 106.9 |
| Brazil | 101.5 |
| Canada | 4,143.1 |
| Chile | 29.8 |
| Colombia | 143.6 |
| Ecuador | 3.6 |
| Mexico | 1,349.6 |
| Peru | 45.3 |
| Trinidad | 164.6 |
| United States | 18,588.0 |
| Venezuela | 1,002.7 |
| Other Latin America | 1.1 |
| **Western Hemisphere** | **26,427.1** |
| Austria | 44.7 |
| Denmark | 133.5 |
| France | 121.5 |
| Germany | 966.3 |
| Greece | 3.6 |
| Ireland | 88.6 |
| Italy | 712.0 |
| Netherlands | 2,919.6 |
| Norway | 869.1 |
| Spain | 46.7 |
| Turkey | 7.1 |
| United Kingdom | 1,954.0 |
| **Western Europe** | **7,866.7** |
| Albania | 24.6 |
| Hungary | 184.4 |
| Romania | 965.5 |
| U.S.S.R. | 28,660.0 |
| Yugoslavia | 94.5 |
| Other Eastern Europe | 186.4 |
| **Eastern Europe & U.S.S.R.** | **30,115.4** |
| Algeria | 1,620.1 |
| Angola | 20.4 |
| Egypt | 264.2 |
| Gabon | 3.6 |
| Libya | 228.5 |
| Nigeria | 114.8 |
| Tunisia | 14.3 |
| Other Africa | 1.2 |
| **Africa** | **2,267.1** |
| Bahrain | 159.5 |
| Iran | 781.0 |
| Iraq | 21.6 |
| Kuwait | 15.1 |
| Oman | 91.2 |
| Qatar | 253.1 |
| Saudi Arabia | 1,590.0 |
| Syria | 47.0 |
| United Arab Emirates | 1,163.8 |
| Other Middle East | 6.8 |
| **Middle East** | **4,129.1** |
| Australia | 756.8 |
| Brunei | 292.1 |
| China | 534.1 |
| India | 476.5 |
| Indonesia | 1,362.6 |
| Japan | 56.7 |
| Malaysia | 584.8 |
| Myanmar (Burma) | 34.9 |
| New Zealand | 146.8 |
| Pakistan | 508.6 |
| Thailand | 265.4 |
| Other Asia-Pacific | 213.8 |
| **Asia-Pacific** | **5,233.1** |
| **TOTAL WORLD** | **76,038.5** |

*Estimated

## Crude oil prices

| | $/bbl | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | U.S. refiner acquisition cost | | | U.S. landed cost of imports | | | | | | | Average export prices | | |
| | | | | | Selected countries | | | | | | | | |
| Year | Domestic | Imported | Composite | Total | Canada | Mexico | United Kingdom | Nigeria | Saudi Arabia | Venezuela | Worldwide | OPEC | Non-OPEC |
| 1976 | 8.84 | 13.48 | 10.89 | 13.34 | 13.57 | NA | NA | 13.80 | 13.04 | 11.80 | NA | NA | NA |
| 1977 | 9.55 | 14.53 | 11.96 | 14.31 | 14.21 | 13.75 | NA | 15.25 | 13.61 | 13.13 | NA | NA | NA |
| 1978 | 10.61 | 14.57 | 12.46 | 14.38 | 14.50 | 13.54 | NA | 14.86 | 13.92 | 12.83 | NA | NA | NA |
| 1979 | 14.27 | 21.67 | 17.72 | 21.65 | 20.43 | 20.86 | 22.16 | 22.96 | 19.15 | 18.18 | NA | NA | NA |
| 1980 | 24.29 | 33.89 | 28.07 | 33.95 | 30.47 | 31.80 | 35.88 | 37.05 | 30.02 | 25.86 | NA | NA | NA |
| 1981 | 34.93 | 37.05 | 35.24 | 36.52 | 32.16 | 33.78 | 37.24 | 39.70 | 34.19 | 29.87 | 34.81 | 34.42 | 36.16 |
| 1982 | 31.22 | 33.55 | 31.87 | 33.18 | 26.92 | 26.64 | 34.28 | 36.17 | 35.00 | 24.82 | 33.33 | 33.71 | 32.3 |
| 1983 | 28.87 | 29.30 | 28.99 | 28.93 | 25.63 | 25.78 | 30.87 | 30.84 | 29.76 | 22.94 | 29.66 | 29.89 | 29.13 |
| 1984 | 28.53 | 28.88 | 28.63 | 28.46 | 26.59 | 26.87 | 29.60 | 30.50 | 29.50 | 25.15 | 28.60 | 28.61 | 28.6 |
| 1985 | 26.66 | 26.99 | 25.75 | 26.66 | 25.71 | 25.63 | 28.35 | 28.96 | 24.72 | 24.43 | 27.60 | 28.00 | 26.98 |
| 1986 | 14.82 | 14.00 | 14.55 | 13.49 | 13.43 | 12.17 | 14.63 | 15.29 | 12.84 | 11.52 | 14.98 | 15.45 | 14.21 |
| 1987 | 17.76 | 18.13 | 17.90 | 17.65 | 17.04 | 16.69 | 18.78 | 19.32 | 16.81 | 15.76 | 17.41 | 17.31 | 17.57 |
| 1988 | 14.74 | 14.56 | 14.67 | 14.08 | 15.15 | 12.58 | 15.82 | 15.88 | 13.37 | 13.66 | 13.79 | 13.67 | 14.04 |
| 1989 | 17.87 | 18.08 | 17.97 | 17.68 | 18.35 | 16.35 | 18.74 | 19.19 | 17.34 | 16.78 | 16.65 | 16.40 | 17.11 |
| 1990 | 22.60 | 21.78 | 22.23 | 21.16 | 22.42 | 19.63 | 22.68 | 23.38 | 21.89 | 20.31 | 21.35 | 20.98 | 22.07 |

From: Oil & Gas Journal Energy Database
Source: U.S. Department of Energy

## Petroleum product prices

| | (¢/gallon) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Motor gasoline-pump price | | | | | Refiner resale (wholesale) product prices | | | | | | | |
| Year | Leaded Regular | Unleaded Regular | Unleaded Premium | Average All-Types | Heating Oil Residential | Motor Gasoline | Aviation Gasoline | Kerosene Jet Fuel | Kerosene | No. 2 Fuel Oil | No. 2 Diesel Oil | Propane | Resid |
| 1978 | 62.60 | 67.00 | NA | 65.20 | 49.00 | 43.40 | 53.70 | 38.60 | 40.40 | 36.90 | 36.50 | 23.70 | 26.30 |
| 1979 | 85.70 | 90.30 | NA | 88.20 | 70.40 | 63.70 | 72.10 | 66.00 | 62.40 | 56.90 | 57.40 | 29.10 | 39.90 |
| 1980 | 119.10 | 124.50 | NA | 122.10 | 97.40 | 94.10 | 112.80 | 86.80 | 86.40 | 80.30 | 80.10 | 41.50 | 52.80 |
| 1981 | 131.10 | 137.80 | 147.00 | 135.30 | 119.40 | 106.40 | 125.00 | 101.20 | 106.60 | 97.60 | 97.20 | 46.60 | 66.30 |
| 1982 | 122.20 | 129.60 | 141.50 | 128.10 | 116.00 | 97.30 | 122.80 | 95.30 | 101.80 | 91.40 | 91.40 | 42.70 | 61.20 |
| 1983 | 115.70 | 124.10 | 138.30 | 122.50 | 107.80 | 88.20 | 117.80 | 85.40 | 89.20 | 81.50 | 80.80 | 48.40 | 60.90 |
| 1984 | 112.90 | 121.20 | 136.60 | 119.80 | 109.10 | 83.20 | 116.50 | 83.00 | 91.60 | 82.10 | 80.30 | 45.00 | 65.40 |
| 1985 | 111.50 | 120.20 | 134.00 | 119.60 | 105.30 | 83.50 | 113.00 | 79.40 | 87.40 | 77.60 | 77.20 | 39.80 | 57.70 |
| 1986 | 85.70 | 92.70 | 108.50 | 93.10 | 83.60 | 53.10 | 91.20 | 49.50 | 60.60 | 48.60 | 45.20 | 29.00 | 30.50 |
| 1987 | 89.70 | 94.80 | 109.30 | 95.70 | 80.30 | 58.90 | 85.90 | 53.80 | 59.20 | 52.70 | 53.40 | 25.20 | 38.50 |
| 1988 | 89.90 | 94.60 | 110.70 | 96.30 | 81.30 | 57.70 | 85.00 | 49.50 | 54.90 | 47.30 | 47.30 | 24.00 | 30.00 |
| 1989 | 99.80 | 102.10 | 119.70 | 106.00 | 90.00 | 65.40 | 95.00 | 58.30 | 66.90 | 56.50 | 56.70 | 24.70 | 36.00 |
| 1990 | 114.90 | 116.40 | 134.90 | 121.70 | 106.20 | 78.60 | 106.30 | 77.30 | 83.90 | 69.70 | 69.40 | 38.70 | 41.20 |

From: Oil & Gas Journal Energy Database
Source: U.S. Department of Energy

## Comparative energy prices

| | Natural gas delivered to consumers | | | | | Cost of fossil fuels delivered to utilities | | | | Electricity retail prices | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ($/MCF) | | | | | (¢/Million BTU) | | | | (¢/Kilowatt Hour) | | | |
| Year | Residential | Commercial | Industrial | Electric Utilities | Average | Coal | Heavy oil | Natural gas | All fuels | Residential | Commercial | Industrial | Total |
| 1973 | 1.29 | 0.94 | 0.50 | 0.38 | 0.68 | 40.5 | 78.5 | 33.8 | 47.6 | 2.54 | 2.41 | 1.25 | 1.96 |
| 1974 | 1.46 | 1.07 | 0.67 | 0.51 | 0.84 | 70.9 | 189.0 | 48.2 | 91.4 | 3.10 | 3.04 | 1.69 | 2.49 |
| 1975 | 1.71 | 1.35 | 0.96 | 0.77 | 1.12 | 81.4 | 200.5 | 75.2 | 104.4 | 3.51 | 3.45 | 2.07 | 2.92 |
| 1976 | 1.98 | 1.64 | 1.24 | 0.98 | 1.37 | 84.8 | 195.2 | 103.4 | 111.9 | 3.73 | 3.69 | 2.21 | 3.09 |
| 1977 | 2.35 | 2.04 | 1.50 | 1.32 | 1.66 | 94.7 | 219.8 | 129.1 | 129.7 | 4.05 | 4.09 | 2.50 | 3.42 |
| 1978 | 2.56 | 2.23 | 1.70 | 1.48 | 1.85 | 111.6 | 212.5 | 142.2 | 141.1 | 4.31 | 4.36 | 2.79 | 3.69 |
| 1979 | 2.98 | 2.73 | 1.99 | 1.81 | 2.21 | 122.4 | 298.8 | 174.9 | 163.9 | 4.64 | 4.68 | 3.05 | 3.99 |
| 1980 | 3.68 | 3.39 | 2.56 | 2.27 | 2.80 | 135.1 | 426.7 | 219.9 | 192.8 | 5.36 | 5.48 | 3.69 | 4.73 |
| 1981 | 4.29 | 4.00 | 3.14 | 2.89 | 3.39 | 153.2 | 533.4 | 280.5 | 225.6 | 6.20 | 6.29 | 4.29 | 5.46 |
| 1982 | 5.17 | 4.82 | 3.87 | 3.48 | 4.15 | 164.70 | 483.0 | 337.6 | 224.9 | 6.86 | 6.86 | 4.95 | 6.13 |
| 1983 | 6.06 | 5.59 | 4.18 | 3.58 | 4.82 | 165.60 | 457.0 | 347.4 | 220.6 | 7.18 | 7.01 | 4.97 | 6.29 |
| 1984 | 6.12 | 5.55 | 4.22 | 3.70 | 4.85 | 166.40 | 481.0 | 360.3 | 219.1 | 7.54 | 7.33 | 5.04 | 6.52 |
| 1985 | 6.12 | 5.50 | 3.95 | 3.55 | 4.72 | 164.8 | 424.4 | 344.4 | 209.4 | 7.79 | 7.47 | 5.16 | 6.71 |
| 1986 | 5.83 | 5.08 | 3.23 | 2.43 | 4.13 | 157.9 | 240.1 | 235.1 | 175.0 | 7.41 | 7.13 | 4.90 | 6.42 |
| 1987 | 5.54 | 4.77 | 2.94 | 2.32 | 4.05 | 150.6 | 297.6 | 224.0 | 170.6 | 7.41 | 7.01 | 4.72 | 6.32 |
| 1988 | 5.47 | 4.63 | 2.95 | 2.33 | 4.09 | 146.6 | 240.5 | 226.3 | 164.3 | 7.49 | 7.07 | 4.62 | 6.31 |
| 1989 | 5.64 | 4.74 | 2.96 | 2.43 | 4.22 | 144.5 | 284.6 | 235.5 | 167.5 | 7.64 | 7.23 | 4.69 | 6.43 |
| 1990 | 5.80 | 4.82 | 2.93 | 2.38 | 4.19 | 145.5 | 331.9 | 232.1 | 168.9 | 7.85 | 7.33 | 4.74 | 6.56 |

From Oil & Gas Journal Energy Database
Source: U.S. Department of Energy

## Price history, crude oil, natural gas and motor gasoline

| | Actual current prices | | | | | | Inflation adjusted real prices | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Crude oil | | | Natural gas | | | Crude oil | | | Natural gas | |
| Year | U.S. avcrage wellhead $/bbl | West Texas inter-mediate posted $/bbl | Motor Gasoline leaded pump price $/gal | U.S. average wellhead $/Mcf | Consumer average $/Mcf | Producer Price index 1982-100 | U.S. average wellhead $/bbl | West Texas Inter-mediate posted $/bbl | Motor Gasoline Leaded pump price $/gal | U.S. average wellhead $/Mcf | Consumer average $/Mcf |
| 1925 | 1.68 | 1.79 | 0.222 | 0.094 | 0.223 | 17.8 | 9.438 | 10.056 | 1.247 | 0.528 | 1.253 |
| 1926 | 1.88 | 1.90 | 0.234 | 0.095 | 0.229 | 17.2 | 10.930 | 11.047 | 1.359 | 0.552 | 1.311 |
| 1927 | 1.30 | 1.28 | 0.211 | 0.088 | 0.220 | 16.5 | 7.879 | 7.758 | 1.278 | 0.533 | 1.333 |
| 1928 | 1.17 | 1.36 | 0.209 | 0.089 | 0.232 | 16.7 | 7.006 | 8.144 | 1.254 | 0.533 | 1.389 |
| 1929 | 1.27 | 1.45 | 0.214 | 0.082 | 0.216 | 16.4 | 7.744 | 8.841 | 1.306 | 0.500 | 1.317 |
| 1930 | 1.19 | 0.95 | 0.200 | 0.076 | 0.214 | 14.9 | 7.987 | 6.376 | 1.339 | 0.510 | 1.436 |
| 1931 | 0.65 | 0.77 | 0.170 | 0.070 | 0.233 | 12.6 | 5.159 | 6.111 | 1.348 | 0.556 | 1.849 |
| 1932 | 0.87 | 0.69 | 0.179 | 0.064 | 0.247 | 11.2 | 7.768 | 6.161 | 1.601 | 0.571 | 2.205 |
| 1933 | 0.67 | 1.00 | 0.178 | 0.062 | 0.237 | 11.4 | 5.877 | 8.772 | 1.563 | 0.544 | 2.079 |
| 1934 | 1.00 | 1.00 | 0.189 | 0.060 | 0.223 | 12.9 | 7.752 | 7.752 | 1.461 | 0.465 | 1.729 |
| 1935 | 0.97 | 1.00 | 0.188 | 0.058 | 0.224 | 13.8 | 7.029 | 7.246 | 1.365 | 0.420 | 1.623 |
| 1936 | 1.09 | 1.10 | 0.195 | 0.055 | 0.220 | 13.9 | 7.842 | 7.914 | 1.399 | 0.396 | 1.583 |
| 1937 | 1.18 | 1.22 | 0.200 | 0.051 | 0.220 | 14.9 | 7.919 | 8.188 | 1.342 | 0.342 | 1.477 |
| 1938 | 1.13 | 1.02 | 0.195 | 0.049 | 0.218 | 13.5 | 8.370 | 7.556 | 1.445 | 0.363 | 1.615 |
| 1939 | 1.02 | 1.02 | 0.188 | 0.049 | 0.216 | 13.3 | 7.669 | 7.699 | 1.410 | 0.368 | 1.624 |
| 1940 | 1.02 | 1.02 | 0.184 | 0.045 | 0.217 | 13.5 | 7.556 | 7.556 | 1.364 | 0.333 | 1.607 |
| 1941 | 1.14 | 1.17 | 0.192 | 0.049 | 0.221 | 15.1 | 7.550 | 7.748 | 1.274 | 0.325 | 1.464 |
| 1942 | 1.19 | 1.17 | 0.204 | 0.051 | 0.227 | 17.0 | 7.000 | 6.882 | 1.202 | 0.300 | 1.335 |
| 1943 | 1.20 | 1.17 | 0.205 | 0.052 | 0.223 | 17.8 | 6.742 | 6.573 | 1.153 | 0.292 | 1.253 |
| 1944 | 1.21 | 1.17 | 0.206 | 0.051 | 0.215 | 17.9 | 6.760 | 6.536 | 1.150 | 0.285 | 1.201 |
| 1945 | 1.22 | 1.17 | 0.205 | 0.049 | 0.214 | 18.2 | 6.703 | 6.429 | 1.126 | 0.269 | 1.176 |
| 1946 | 1.41 | 1.36 | 0.208 | 0.053 | 0.220 | 20.8 | 6.779 | 6.524 | 0.999 | 0.255 | 1.058 |
| 1947 | 1.93 | 1.84 | 0.231 | 0.060 | 0.232 | 25.6 | 7.539 | 7.188 | 0.903 | 0.234 | 0.906 |
| 1948 | 2.60 | 2.57 | 0.259 | 0.065 | 0.241 | 27.7 | 9.386 | 9.278 | 0.934 | 0.235 | 0.870 |
| 1949 | 2.54 | 2.57 | 0.268 | 0.063 | 0.254 | 26.3 | 9.658 | 9.772 | 1.019 | 0.240 | 0.966 |
| 1950 | 2.51 | 2.57 | 0.268 | 0.065 | 0.266 | 27.3 | 9.194 | 9.414 | 0.980 | 0.238 | 0.974 |
| 1951 | 2.53 | 2.57 | 0.272 | 0.073 | 0.298 | 30.4 | 8.322 | 8.454 | 0.893 | 0.240 | 0.980 |
| 1952 | 2.53 | 2.57 | 0.276 | 0.078 | 0.332 | 29.6 | 8.547 | 8.682 | 0.931 | 0.264 | 1.122 |
| 1953 | 2.68 | 2.72 | 0.287 | 0.092 | 0.355 | 29.2 | 9.178 | 9.298 | 0.983 | 0.315 | 1.216 |
| 1954 | 2.78 | 2.82 | 0.290 | 0.101 | 0.381 | 29.3 | 9.488 | 9.625 | 0.991 | 0.345 | 1.300 |
| 1955 | 2.77 | 2.82 | 0.291 | 0.104 | 0.400 | 29.3 | 9.454 | 9.625 | 0.992 | 0.355 | 1.365 |
| 1956 | 2.79 | 2.82 | 0.299 | 0.108 | 0.415 | 30.3 | 9.208 | 9.307 | 0.988 | 0.356 | 1.370 |
| 1957 | 3.09 | 3.04 | 0.310 | 0.113 | 0.431 | 31.2 | 9.904 | 9.753 | 0.992 | 0.362 | 1.381 |
| 1958 | 3.01 | 3.06 | 0.304 | 0.119 | 0.462 | 31.6 | 9.525 | 9.677 | 0.961 | 0.377 | 1.462 |
| 1959 | 2.90 | 2.98 | 0.305 | 0.129 | 0.477 | 31.7 | 9.148 | 9.385 | 0.962 | 0.407 | 1.505 |
| 1960 | 2.88 | 2.97 | 0.311 | 0.140 | 0.500 | 31.7 | 9.085 | 9.369 | 0.982 | 0.442 | 1.577 |
| 1961 | 2.89 | 2.97 | 0.308 | 0.151 | 0.510 | 31.6 | 9.146 | 9.399 | 0.973 | 0.478 | 1.614 |
| 1962 | 2.90 | 2.97 | 0.306 | 0.155 | 0.514 | 31.7 | 9.148 | 9.369 | 0.967 | 0.489 | 1.621 |
| 1963 | 2.89 | 2.97 | 0.304 | 0.158 | 0.512 | 31.6 | 9.146 | 9.399 | 0.963 | 0.500 | 1.620 |
| 1964 | 2.88 | 2.95 | 0.304 | 0.154 | 0.519 | 31.6 | 9.114 | 9.320 | 0.962 | 0.487 | 1.642 |
| 1965 | 2.86 | 2.92 | 0.312 | 0.156 | 0.522 | 32.3 | 8.854 | 9.040 | 0.966 | 0.483 | 1.616 |
| 1966 | 2.88 | 2.94 | 0.321 | 0.157 | 0.523 | 33.3 | 8.649 | 8.817 | 0.964 | 0.471 | 1.571 |
| 1967 | 2.92 | 3.03 | 0.332 | 0.160 | 0.520 | 33.4 | 8.743 | 9.060 | 0.994 | 0.479 | 1.557 |
| 1968 | 2.94 | 3.07 | 0.337 | 0.164 | 0.504 | 34.2 | 8.596 | 8.977 | 0.985 | 0.480 | 1.474 |
| 1969 | 3.09 | 3.30 | 0.348 | 0.167 | 0.515 | 35.6 | 8.680 | 9.256 | 0.978 | 0.469 | 1.447 |
| 1970 | 3.18 | 3.35 | 0.357 | 0.171 | 0.550 | 36.9 | 8.618 | 9.079 | 0.967 | 0.463 | 1.491 |
| 1971 | 3.39 | 3.56 | 0.364 | 0.182 | 0.590 | 38.0 | 8.921 | 9.368 | 0.958 | 0.479 | 1.553 |
| 1972 | 3.39 | 3.56 | 0.361 | 0.186 | 0.630 | 39.8 | 8.518 | 8.945 | 0.907 | 0.467 | 1.583 |
| 1973 | 3.89 | 3.87 | 0.388 | 0.216 | 0.680 | 45.0 | 8.644 | 8.604 | 0.862 | 0.480 | 1.511 |
| 1974 | 6.74 | 10.37 | 0.532 | 0.304 | 0.840 | 53.5 | 12.598 | 19.383 | 0.994 | 0.568 | 1.570 |
| 1975 | 7.56 | 11.16 | 0.567 | 0.445 | 1.120 | 58.4 | 12.945 | 19.110 | 0.971 | 0.762 | 1.918 |
| 1976 | 8.14 | 12.65 | 0.590 | 0.580 | 1.370 | 61.1 | 13.322 | 20.704 | 0.966 | 0.949 | 2.242 |
| 1977 | 8.57 | 14.30 | 0.622 | 0.790 | 1.660 | 64.9 | 13.205 | 22.034 | 0.958 | 1.217 | 2.558 |
| 1978 | 8.96 | 14.85 | 0.626 | 0.905 | 1.850 | 69.9 | 12.818 | 21.245 | 0.896 | 1.295 | 2.647 |
| 1979 | 12.51 | 22.40 | 0.857 | 1.178 | 2.210 | 78.7 | 15.896 | 28.463 | 1.089 | 1.497 | 2.808 |
| 1980 | 21.59 | 37.37 | 1.191 | 1.590 | 2.800 | 89.7 | 24.069 | 41.661 | 1.328 | 1.773 | 3.122 |
| 1981 | 31.77 | 36.67 | 1.311 | 1.980 | 3.390 | 98.0 | 32.418 | 37.418 | 1.338 | 2.020 | 3.459 |
| 1982 | 28.52 | 32.75 | 1.222 | 2.460 | 4.150 | 100.0 | 28.520 | 32.750 | 1.222 | 2.460 | 4.150 |
| 1983 | 26.19 | 30.25 | 1.157 | 2.590 | 4.820 | 101.2 | 25.879 | 29.891 | 1.143 | 2.559 | 4.763 |
| 1984 | 25.88 | 29.83 | 1.129 | 2.660 | 4.850 | 103.6 | 24.981 | 28.793 | 1.090 | 2.568 | 4.681 |
| 1985 | 24.09 | 28.08 | 1.115 | 2.510 | 4.720 | 103.1 | 23.366 | 27.236 | 1.081 | 2.435 | 4.578 |
| 1986 | 12.51 | 16.44 | 0.857 | 1.940 | 4.130 | 100.1 | 12.498 | 16.421 | 0.856 | 1.938 | 4.046 |
| 1987 | 15.40 | 18.21 | 0.897 | 1.670 | 4.050 | 102.8 | 14.981 | 17.714 | 0.873 | 1.625 | 3.940 |
| 1988 | 12.58 | 15.52 | 0.899 | 1.690 | 4.090 | 106.9 | 11.768 | 14.518 | 0.841 | 1.581 | 3.826 |
| 1989 | 15.86 | 18.29 | 0.998 | 1.690 | 4.220 | 112.2 | 14.135 | 16.301 | 0.889 | 1.506 | 3.761 |
| 1990 | 20.03 | 23.17 | 1.149 | 1.710 | 4.190 | 116.3 | 17.223 | 19.923 | 0.988 | 1.470 | 3.603 |

From: Oil & Gas Journal Energy Database
Source: U.S. Department of Energy

MMcfd of mostly Rocky Mountain gas to fuel enhanced oil recovery projects near Bakersfield, Calif. The 676 mile line begins near Northwest Pipeline Inc.'s Opal, Wyo., gas processing plant and merges with a sister project at the California line.

Kern River plans to add another 452 MMcfd of capacity with a $308 million project to provide transportation for shippers selling Canadian gas into California markets through Altamont Gas Transmission Co.'s proposed pipeline.

Completion of Kern River's proposed expansion is to coincide with Altamont's expected start-up in November 1993. Nine firm shippers have fully subscribed the expanded capacity.

The 30 in. Altamont pipeline is to run 620 miles from the Canadian border crossover at Wild Horse, Mont., and join Kern River near Opal. It is envisioned to transport as much as 719 MMcfd.

Another project to move Canadian gas to California began preliminary construction late in 1991, targeting completion by November 1993.

Pacific Gas & Electric Co. and Pacific Gas Transmission Co. were pushing a $1.5 billion, 844 mile expansion of the PGT line from the Idaho-Alberta border to a point near Panoche, Calif.

Project sponsors are installing in 1992 almost 480 miles of 42 in. line. In 1993 they expect to complete the pipeline with more than 210 miles of 42 in.

The expansion will move more than 900 MMcfd of Canadian gas to a California market estimated to need an additional 2.1 bcfd by 2010.

Gas pipeline capacity out of the San Juan basin in New Mexico jumped by more than 1.3 bcfd in 1992 when projects by El Paso Natural Gas Co. and Transwestern Pipeline Co. were completed.

Transwestern began service on a 520 MMcfd lateral out of San Juan and a 340 MMcfd expansion of its main line.

The San Juan lateral consists of a 100 mile, 30 in. pipeline from a new compressor station near Blanco, N.M., to a connection with Transwestern's main line near Thoreau, N.M. For the expansion, the company laid 200 miles of 30 in. loop and made minor changes at compressor stations.

The project will run to more than $258 million—$165 million for the main line expansion and $93 million for the lateral.

El Paso began operating 835 MMCfd of added capacity out of the San Juan basin. The $241.5 million expansion increased El Paso's system capacity to 2.5 bcfd for gas leaving San Juan. About 400 MMcfd of new capacity is available on the company's westbound main line.

Installation of bidirectional transportation allows El Paso to move 435 MMcfd of gas east on its Permian basin-San Juan basin crossover.

Two pipeline projects proposed in the southeastern U.S. will increase gas supplies to Florida. A smaller project will provide an important outlet for gas leaving the Mobile Bay area off Alabama.

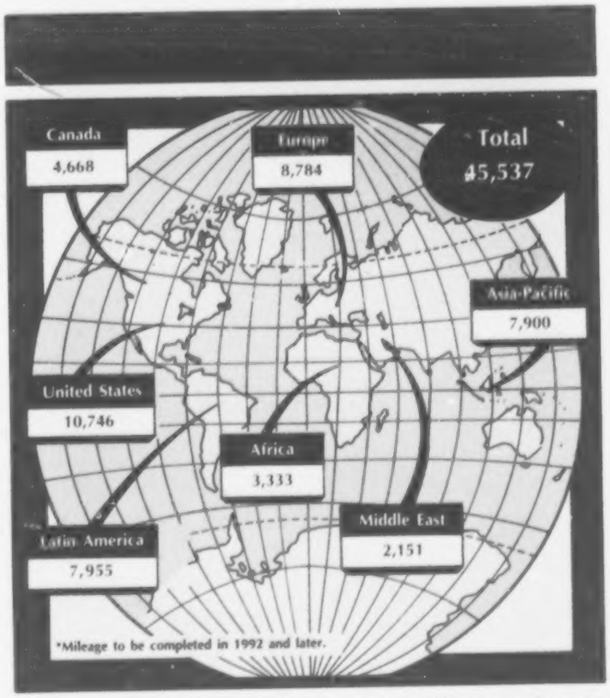
United Gas Pipe Line Co. (UGPL) began moving gas through Gateway Pipeline. The $22 million, 30 in. line moves as much as 600 MMcfd of gas 25 miles from treatment plants in southern Mobile County, Ala., to UGPL's 30 in. Lirette pipeline.

Gateway capacity can be increased to 1.2 bcfd by adding compression.

UGPL and ANR Southern Pipeline Co., a unit of Coastal Corp., were expected by midyear to file an application to construct SunCoast Pipeline, a 560 mile intrastate pipeline that at first will add about 400 MMcfd of gas to Florida markets.

Capacity on the $800 million system can be expanded to 1.2 bcfd with additional compression.

SunCoast will transport gas from UGPL's system terminus near Pensacola in the Florida Panhandle to markets in northern and central parts of the state. UGPL and ANR expect to begin construction of the new line in July 1993 and to begin transporting gas in November 1994.



*Mileage to be completed in 1992 and later.

Florida Gas Transmission filed with the FERC late in 1991 for a permit nearly to double system capacity by as much as 875 MMcfd to serve the Tampa-St. Petersburg area. Cost of the project is estimated at $940.

Florida also will be the site of a products pipeline project.

In 1993 GATX Terminals plans to lay a 125 mile, 10 in. products pipeline in Florida to be known as the Southwest Florida Pipeline Co.

Koch Hydrocarbons also plans a 583 mile, 12 in., 100,000 b/d products line from Medford, Okla., to Mont Belvieu, Tex.

It will connect Koch's 170,000 b/d Medford fractionator with Gulf Coast petrochemical markets. The line replaces an 8 in., 40,000 b/d line which will be converted to a crude oil gathering line.

Seminole Pipeline will add a 14 in., 535 mile line to its NGL system from Gaines County in West Texas to Mont Belvieu. Operational target date for the line is first quarter 1993, increasing capacity to more than 300,000 b/d from its current 140,000 b/d.

## North Sea projects

In the North Sea, work continues on the first phase of the Zeepipe system, a 500 mile, 40 in. line from Sleipner to Zeebrugge, Belgium, a 25 mile, 30 in. link to the Statpipe riser platform on Block 16/11, and the 140 mile, 20 in. condensate line to Karsto, Norway.

Zeepipe's second phase, a 184 mile, 40 in. extension, will be built to the Troll gas terminal. Start-up is anticipated in 1996.

A third major gas pipeline from the North Sea to continental Europe is planned by Zeepipe partners. The 403 mile Europipe will extend from the Statpipe riser platform to a point near Emden, Germany. It could be operating as early as 1995.

Statoil has announced pipe orders for the latter two projects.

## Pipeline costs: estimated vs. actual, 1989-91*

| Size, in., and location | Length, miles | Costs, $ Materials | Labor | Misc. | R.O.W & damages | Total | $/mile |
|---|---|---|---|---|---|---|---|
| **Land pipelines** | | | | | | | |
| 6 Kentucky | 4.86 | | | | | | |
| Estimated | | 411,900 | 557,300 | 1,454,100 | 16,500 | 2,439,800 | 499,959 |
| Actual | | 277,450 | 792,410 | 1,115,010 | 11,360 | 2,196,230 | 450,047 |
| 8 Tennessee (L) | 1.10 | | | | | | |
| Estimated | | 76,500 | 130,580 | 39,070 | 25,850 | 242,000 | 220,000 |
| Actual | | 72,668 | 110,603 | 40,275 | 15,542 | 239,088 | 217,353 |
| 8 Wyoming | 435 | | | | | | |
| Estimated | | 311,000 | 287,000 | 183,940 | 16,000 | 797,940 | 183,434 |
| Actual | | 317,544 | 322,998 | 121,508 | 11,425 | 773,475 | 177,810 |
| 10 Connecticut | 0.90 | | | | | | |
| Estimated | | 160,500 | 707,200 | 586,100 | 141,200 | 1,595,000 | 1,772,222 |
| Actual | | 159,882 | 742,831 | 546,174 | 175,390 | 1,624,277 | 1,804,752 |
| 10 Massachusetts | 0.54 | | | | | | |
| Estimated | | 63,200 | 204,450 | 71,510 | 1,000 | 340,160 | 629,926 |
| Actual | | 71,411 | 214,539 | 72,705 | 980 | 359,635 | 665,991 |
| 12 Oklahoma | 12.40 | | | | | | |
| Estimated | | 977,000 | 715,500 | 275,050 | 386,700 | 2,354,250 | 189,859 |
| Actual | | 839,000 | 690,600 | 276,000 | 563,000 | 2,368,600 | 191,016 |
| 16 Pennsylvania (L) | 2.25 | | | | | | |
| Estimated | | 511,101 | 852,445 | 352,254 | 35,450 | 1,751,250 | 778,333 |
| Actual | | 512,864 | 935,814 | 453,105 | 58,015 | 1,959,798 | 871,021 |
| 16 North Carolina | 7.50 | | | | | | |
| Estimated | | 776,700 | 2,159,600 | 758,111 | 185,700 | 3,880,111 | 517,348 |
| Actual | | 701,464 | 1,931,589 | 432,096 | 116,335 | 3,181,484 | 424,198 |
| 16 Indiana (L) | 59.01 | | | | | | |
| Estimated | | 6,274,000 | 7,767,000 | 2,798,520 | 1,302,000 | 18,141,520 | 307,431 |
| Actual | | 5,822,704 | 10,980,941 | 2,719,060 | 1,459,952 | 20,982,657 | 355,578 |
| 20 Texas-Louisiana | 5.60 | | | | | | |
| Estimated | | 964,000 | 756,000 | 245,000 | 90,000 | 2,055,000 | 366,964 |
| Actual | | 856,829 | 597,736 | 198,043 | 148,967 | 1,801,575 | 321,710 |
| 20 Kentucky (L) | 3.42 | | | | | | |
| Estimated | | 515,000 | 603,000 | 162,620 | 81,000 | 1,361,620 | 398,135 |
| Actual | | 436,565 | 653,432 | 210,455 | 31,384 | 1,331,836 | 389,426 |
| 20 Indiana (L) | 66.28 | | | | | | |
| Estimated | | 9,614,000 | 10,639,000 | 3,824,920 | 1,968,000 | 26,045,920 | 381,458 |
| Actual | | 8,517,188 | 14,002,414 | 4,233,469 | 3,652,477 | 30,405,548 | 445,307 |
| 20 Utah | 81.00 | | | | | | |
| Estimated | | 9,042,950 | 6,434,600 | 3,869,100 | 368,900 | 19,715,550 | 241,612 |
| Actual | | 8,536,743 | 10,713,206 | 5,247,886 | 324,345 | 24,822,180 | 304,193 |
| 22 Tennessee (C) | 0.48 | | | | | | |
| Estimated | | 325,000 | 857,600 | 375,680 | 8,000 | 1,566,280 | 3,263,083 |
| Actual | | 324,473 | 1,213,038 | 186,036 | 1,285 | 1,724,832 | 3,593,400 |
| 24 Pennsylvania | 27.60 | | | | | | |
| Estimated | | 4,466,500 | 7,564,800 | 1,632,700 | 1,456,000 | 15,120,000 | 547,826 |
| Actual | | 4,113,100 | 12,035,500 | 2,115,200 | 259,800 | 18,523,600 | 671,145 |
| 30 Pennsylvania (L) | 5.15 | | | | | | |
| Estimated | | 1,921,425 | 2,870,686 | 1,162,889 | 82,400 | 6,037,400 | 1,172,311 |
| Actual | | 1,922,747 | 2,477,263 | 999,295 | 99,942 | 5,499,247 | 1,067,815 |
| 36 Pennsylvania (L) | 8.22 | | | | | | |
| Estimated | | 4,190,223 | 4,786,946 | 2,094,981 | 263,300 | 11,335,450 | 1,379,009 |
| Actual | | 4,413,958 | 5,103,026 | 2,402,903 | 336,162 | 12,256,049 | 1,491,004 |
| 42 Georgia | 12.05 | | | | | | |
| Estimated | | 5,462,610 | 3,995,160 | 2,592,490 | 327,760 | 12,378,020 | 1,027,221 |
| Actual | | 5,103,883 | 5,667 982 | 3,581,906 | 359,958 | 14,713,700 | 1,221,055 |
| 48 Alabama | 15.17 | | | | | | |
| Estimated | | 8,743,954 | 5,975,585 | 3,973,679 | 461,130 | 19,154,348 | 1,262,647 |
| Actual | | 8,757,285 | 6,147,733 | 4,825,912 | 404,593 | 20,135,543 | 1,327,326 |
| **Total land** | **320.50** | | | | | | |
| **Estimated** | | **$54,717,543** | **$57,844,452** | **$26,452,714** | **$7,216,890** | **$146,311,819** | **$456,511** |
| **Actual** | | **$51,757,778** | **$75,333,656** | **$29,777,038** | **$8,030,892** | **$164,899,363** | **$514,507** |
| **Offshore pipelines** | | | | | | | |
| 10 Louisiana | 4.02 | | | | | | |
| Estimated | | 372,739 | 542,080 | 397,809 | 100 | 1,312,728 | 326,549 |
| Actual | | 439,720 | 718,394 | 225,763 | 102 | 1,383,979 | 344,273 |
| 16 Louisiana | 10.22 | | | | | | |
| Estimated | | 1,762,344 | 1,225,800 | 1,142,096 | 245 | 4,129,485 | 404,059 |
| Actual | | 1,554,487 | 1,293,540 | 562,560 | 172 | 3,410,759 | 333,734 |
| 16 Louisiana | 26.57 | | | | | | |
| Estimated | | 4,965,097 | 3,195,783 | 2,887,210 | 499 | 11,048,589 | 415,829 |
| Actual | | 4,989,580 | 4,181,227 | 1,315,608 | 478 | 10,486,893 | 394,689 |
| 20 Louisiana | 25.39 | | | | | | |
| Estimated | | 4,645,439 | 5,134,038 | 3,415,440 | 476 | 13,195,393 | 519,708 |
| Actual | | 4,659,377 | 4,821,843 | 1,399,178 | 419 | 10,880,817 | 428,547 |
| 24 Louisiana | 20.03 | | | | | | |
| Estimated | | 7,809,000 | 5,200,000 | 2,237,830 | – | 15,246,830 | 761,200 |
| Actual | | 7,421,000 | 7,916,900 | 2,746,900 | – | 18,084,800 | 902,886 |
| **Total offshore** | **86.23** | | | | | | |
| **Estimated** | | **$19,564,619** | **$15,297,701** | **$10,079,385** | **$1,320** | **$44,933,625** | **$521,063** |
| **Actual** | | **$19,064,164** | **$18,931,964** | **$6,250,009** | **$1,171** | **$44,247,248** | **$513,131** |
| **Total land + offshore** | **406.73** | | | | | | |
| **Estimated** | | **$74,282,162** | **$73,142,153** | **$36,532,099** | **$7,218,210** | **$191,244,844** | **$470,200** |
| **Actual** | | **$70,821,942** | **$94,265,620** | **$36,027,047** | **$8,032,063** | **$209,146,611** | **$514,215** |

Source: U.S. FERC completed-project cost filings, Jan. 1, 1989, to June 30, 1991, under CFR Section 157.20(c)(4).

*Actual cost data must be filed within 6 months following final hydrostatic test of pipeline. Not all projects proposed (estimated costs) are built (actual costs). L = Loop; C = River or channel crossing.

†Generally includes engr. supv., surveying, interest, administration and overheads, contingencies, and FERC fees.

## Natural gas pipeline transmission expenses*

| | Expenses, $ | | Cost/mile, $ | | Cost/MMcf sold, $ | |
|---|---|---|---|---|---|---|
| | 1988-majors† | 1989-majors§ | 1988-majors† | 1989-majors§ | 1988-majors† | 1989-majors§ |
| **Operation expenses** | | | | | | |
| Supervision and engineering | 166,584,029 | 176,198,733 | 661.37 | 693.53 | 26.16 | 31.69 |
| System control and load dispatching | 29,284,519 | 33,213,655 | 116.26 | 130.73 | 4.60 | 5.97 |
| Communication system expenses | 30,224,686 | 31,600,547 | 120.00 | 124.38 | 4.75 | 5.68 |
| Compressor station labor and expenses | 269,976,844 | 296,448,577 | 1,071.86 | 1,166.85 | 42.39 | 53.32 |
| Gas for compressor-station fuel | 375,892,286 | 376,998,680 | 1,492.36 | 1,483.90 | 59.02 | 67.81 |
| Other fuel and power for compressor stations | 65,481,393 | 54,138,692 | 259.97 | 213.09 | 10.28 | 9.74 |
| Mains | 182,166,091 | 174,280,381 | 723.23 | 685.98 | 28.60 | 31.35 |
| Measuring and regulating station expenses | 61,872,085 | 64,760,794 | 245.64 | 254.90 | 9.72 | 11.65 |
| Transmission and compression of gas by others | 936,299,992 | 854,273,433 | 3,717.28 | 3,362.50 | 147.02 | 153.66 |
| Other transmission expenses | 40,409,766 | 53,942,932 | 160.43 | 212.32 | 6.35 | 9.70 |
| Rents | 19,796,436 | 21,199,398 | 78.60 | 83.44 | 3.11 | 3.81 |
| **Total operation expenses** | **$2,177,988,127** | **$2,137,055,822** | **$8,647.00** | **$8,411.66** | **$341.98** | **$384.40** |
| **Maintenance expenses** | | | | | | |
| Supervision and engineering | 31,519,887 | 34,610,110 | 125.14 | 136.23 | 4.95 | 6.23 |
| Structures and improvements | 22,517,885 | 20,767,763 | 89.40 | 81.74 | 3.54 | 3.74 |
| Mains | 109,462,229 | 114,999,238 | 434.58 | 452.65 | 17.19 | 20.69 |
| Compressor-station equipment | 218,175,493 | 251,193,978 | 866.20 | 988.72 | 34.26 | 45.18 |
| Measuring and regulating station equipment | 13,202,645 | 14,567,775 | 52.42 | 57.34 | 2.07 | 2.62 |
| Communication equipment | 11,906,439 | 10,414,463 | 47.27 | 40.99 | 1.87 | 1.87 |
| Other equipment | 4,036,815 | 5,669,129 | 16.03 | 22.31 | 0.63 | 1.02 |
| **Total maintenance expenses** | **$410,821,393** | **$452,222,456** | **$1,631.03** | **$1,779.98** | **$64.51** | **$81.34** |
| **Total transmission expenses** | **$2,588,809,520** | **$2,589,278,278** | **$10,278.03** | **$10,191.64** | **$406.49** | **$465.75** |
| **Total miles of transmission pipeline** | **251,878** | **254,059** | | | | |
| **Total natural gas sold, MMcf** | **6,368,682** | **5,559,409** | | | | |

Source: Statistics of Interstate Natural Gas Pipeline Companies—1988 & 1989, U.S. Department of Energy. *U.S. interstate pipelines for calendar years 1988 & 1989. † 46 of 135 companies filing Forms 2s or 2As with the U.S. FERC for 1988; majors are companies whose combined gas sold for resale and gas transported or stored for a fee exceed 50 bcf (at 14.7 psi; 60° F.) in each of the 3 previous calendar years. §45 of 144 companies filing Forms 2 or 2A with the U.S. FERC for 1989; majors defined in previous note and in U.S. FERC Accounting and Reporting Requirements for Natural Gas Companies, para. 20-011, effective Feb. 2, 1985, beginning with the 1984 reporting year (OGJ, Nov. 25, 1985, p. 80).

Saga Petroleum AS disclosed plans for a 410 mile, 32 in. pipeline to move gas from its Haltenbanken development.

Other gas line action is related to the first export of gas from the British North Sea to continental Europe when Ultramar Exploration's Markham field begins deliveries in October 1992 through a 24 in. line.

Gas from the field, which straddles the boundary between the U.K. and Dutch sectors, will be split between Netherlands' Gasunie and Germany's Wintershall AG.

Exports to Gasunie alone will build to 37.3 bcf/year. Deliveries to Wintershall will start in 1993 and reach 15 bcf/year.

In other action, the Irish government approved a 170 mile gas pipeline across the Irish Sea to Scotland. A 70 mile onshore section will move gas into the Scottish grid.

That project is expected to cost about $247 million. The state owned Irish gas company could place contracts in 1992 with the offshore portion laid in 1993.

### Germany, Mediterranean

Another major center of pipeline activity lies in Germany.

The two German giants in gas transportation—Wintershall and Ruhrgas AG—are scrambling to secure gas supplies and elbowing each other to lay pipelines into the eastern part of the country.

Ruhrgas started service in 1992 on a 37 mile link from Lauterback, Hesse, to Vitzeroda, Thuringia. Another German pipeline company, EVG, started up its 186 mile line from Vitzeroda to Niederhohndorf, Saxony.

The gas in these systems is urgently needed to displace highly polluting lignite used by local industrial and commercial interests.

Wintershall is also completing in 1992 a 190 mile gas pipeline on its Stegal system into Czechoslovakia. The company expects to complete a 370 mile gas line from Emden to Ludvigshaven by the end of 1993.

And much more construction seems certain as more gas comes in from the North Sea and as Russian gas secures more customers in exchange for badly needed hard currency.

A considerable amount of work may be available on oil and gas line in the republics of the former Soviet Union. The poor condition of the massive gas lines bringing Russian gas to western Europe is common knowledge.

But the republics must find the cash to pay for the extensive rehabilitaion work needed.

The condition of the system poses not only a safety and environmental headache, but with much of the system deteriorating, line pressures—and therefore throughputs—must be reduced. Reduced deliveries lead to reduced cash flow. That's not what the republics need.

Finally in Germany, a group led by Deutsche Shell AG plans to lay a 280 mile petroleum products line between the Hamburg refining center and Dresden in eastern Germany. The line has targeted 1994-95 for start-up.

Elsewhere, plans are advancing for a second trans-Mediterranean pipeline to move Algerian gas to Europe. A

## U.S. interstate pipeline mileage

| Year | Miles<br>Gas | <br>Liquid | <br>Total |
|---|---|---|---|
| 1981 | 274,634 | 172,815 | 447,449 |
| 1982 | 286,999 | 172,549 | 459,548 |
| 1983 | 285,204 | 167,819 | 453,023 |
| 1984 | *258,379 | 173,922 | *432,301 |
| 1985 | *279,395 | 171,401 | *450,796 |
| 1986 | *281,881 | 170,014 | *451,895 |
| 1987 | *280,085 | 167,865 | *447,950 |
| 1988 | *281,381 | 170,457 | *451,838 |
| **1989** | ***273,401** | **168,637** | ***442,038** |
| **1990** | ***274,628** | **168,364** | ***442,992** |

Source: U.S. FERC Form 6, annual reports—oil pipelines, Forms 2 & 2A—gas pipelines.

*Reflects operating mileage as reported under the FERC's classification system for natural-gas pipeline companies effective beginning with the 1984 reporting year. Only major gas-pipeline companies are required to file mileage.

combine of six companies has undertaken a feasibility study for the 1,250 mile line from Algeria through Morocco and across the Mediterranean to Spain. The line could be operational by 2000.

### Latin America, Asia-Africa

The last 44 miles of a 300 mile pipeline connecting Cusiana field in Colombia to Covenas is complete.

In January 1992, International Finance Corp. (IFC) and a group of nine banks agreed to lend Colombia $130 million to complete the pipeline, which begins in Huila province before connecting with Cusiana.

Cusiana is being developed by a group led by British Petroleum.

Infraestrutura de Gas a Regiao Sul SA (Infragas), a group of 107 companies based in the Brazilian states of Parana and Catarina, may by the end of 1994 start up a 140 MMcfd gas pipeline system in southern Brazil.

Phase 1 of the project includes building an LNG terminal in Parana or Catarina and laying a 236 mile gas grid in the two states. Cost is estimated at $430 million.

Petroleo Brasileiro SA (Petrobras) expected to complete a 95 mile, 18 in. Osplan II products line from the Guararema tank farm to the Replan refinery in Sao Paulo in 1992.

Late in 1991 Petrobras agreed to import as much as 2.8 bcfd from Bolivia beginning in late 1994, with supplies doubling in 2000. Brazilian and Bolivian oil officials are determining the cost and diameter of the required 900-1,050 mile pipeline.

Also, Argentina's Yacimientos Petroleos Fiscales is studying a plan to lay a 125 mile pipeline to connect Palmar Largo oil fields to the Campo Duran refinery in Salta province near Bolivia.

If laid, the line would pass near Tonono and Santa Victoria areas where Global Resources and Cia. General de Combustibles may lay two 44 mile pipelines to transport oil to the Campo Duran refinery.

Late in 1992 the five company Chilean group, Gasnatural, disclosed plans for a $600 million, 175 MMcfd pipeline to transport gas from Argentina to Chile.

In Africa last year, Nigerian National Petroleum Corp. let contracts valued at $583 million for a project that includes 1,250 miles of oil pipeline and about 3.1 million bbl of storage. Work could be complete by late in 1993.

In Zimbabwe, IFC loaned $32 million to Petrozim Line (PVT) Ltd. to complete a $66.7 million, 125 mile products pipeline from Feruka to Harare. The line will extend an existing system from the port of Beira, Mozambique, to Feruka.

Petrozim is a joint venture of Zimbabwe National Oil Co. and Lonhro plc.

In Japan, 32 gas, power, and trading companies agreed to build a $23.6 billion, 2,000 mile gas pipeline system linking Sakhalin Island in the Russian Far East to the southern tip of Japan's Island of Kyushu. The system could be supplying fuel to Japan by 2005.

Early plans have the pipeline crossing La Perouse Strait from Sakhalin to the Island of Hokkaido, running down the Pacific side of the main Japanese Island, Honshu, crossing the Inland Sea to Kyushu, and terminating in the southern city of Kagoshima.

Thai Petroleum Pipeline Co. Ltd. (TPPC) in late 1991 let $12 million contract to John Brown Engineers & Constructors Ltd. to engineer and procure components for a 145 mile products pipeline from Sriracha to Saraburi.

TPPC is a joint venture of Petroleum Authority of Thailand, Bangkok Aviation Fuel Service, and units of BP, Caltex, Exxon Corp., Kuwait National Petroleum Corp., Mobil Oil Corp., and Royal Dutch/Shell Group.

By 1993, TPPC also plans to lay a 145 mile pipeline to move refined products from Sriracha to Bangkok terminals and storage sites.

### Construction costs

Construction cost estimates for planned U.S. interstate gas pipelines are indicative of the cost of building a pipeline for any service anywhere in the world.

Regulated U.S. interstate gas pipeline companies report cost estimates to FERC as part of filings to gain authorization to add or replace segments of line. The latest available figures for such estimates are current through mid-1991.

For proposed U.S. gas pipeline projects in the most recent 12 month period surveyed, the average onshore cost was $596,747/mile, a decline of more than 28% for the 12 month period immediately preceding.

For offshore projects, the most current figure was $637,732/mile, a decline of 23.5% from the period immediately preceding.

Combined onshore and offshore projects show a cost of $597,222/mile for this year's coverage.

Analyses of the four major categories of pipeline construction costs—material, labor, right-of-way, and miscellaneous—also can indicate trends within each group.

Right-of-way figures include the cost of obtaining right-of-way and of surveying, along with allowance for damages.

Miscellaneous generally includes engineering, supervision, contingencies, allowances for funds used during construction (afudc), administration and overheads, and FERC filing fees.

For the 129 projects surveyed for the most recent period, cost per mile data for the four categories are as follows:

- Material—Onshore $217,348/mile, offshore $212,734/mile, combined $217,294/mile.
- Labor—Onshore $228,984/mile, offshore $306,752/mile, combined $229,890/mile.
- Right-of-way and damages—-Onshore $25,994/mile, offshore $81/mile, combined $25,692/mile.
- Miscellaneous—Onshore $121,610/mile, offshore $117,765/mile, combined $121,565/mile.

Although generalizations are difficult to make concerning trends in construction costs, the cost per mile figures within a given diameter category indicate that the longer the pipeline, the lower the incremental cost for construction.

Nonetheless, road and river crossings and marshy or rocky terrain each strongly affects pipeline construction costs. Material and labor make up almost 75% of the cost of laying onshore pipelines and almost 81% of the cost for offshore pipelines.

Compressor station costs make up another major cost

## Investment in liquids pipelines

| | Company and investment, $ | | | | | | |
|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | Total, $ | % |
| **CRUDE PIPELINES INVESTMENT BY FIVE COMPANIES** | | | | | | | |
| Land | 2,224,047 | 814,497 | 292,759 | 1,028,888 | 1,230,339 | 5,590,530 | 0.31 |
| Right-of-way | 12,288,388 | 1,006,210 | 316,392 | 16,762,182 | 16,147,724 | 46,520,898 | 2.56 |
| Line pipe | 138,201,963 | 25,703,218 | 7,797,471 | 98,709,406 | 163,529,084 | 433,941,141 | 23.85 |
| Line pipe fittings | 10,642,039 | 982,984 | 1,386,293 | 18,837,972 | 30,926,806 | 62,776,094 | 3.45 |
| Pipeline construction | 204,582,562 | 27,837,622 | 10,931,879 | 228,925,084 | 259,264,943 | 731,542,090 | 40.20 |
| Buildings | 27,877,166 | 5,016,815 | 2,568,027 | 14,891,186 | 11,797,326 | 62,150,520 | 3.42 |
| Boilers | — | — | — | — | — | — | |
| Pumping equipment | 25,682,665 | 5,556,816 | 2,423,767 | 19,946,720 | 48,562,327 | 102,172,295 | 5.61 |
| Machine tools and machinery | — | — | — | 33,938 | — | 33,938 | 0.00 |
| Other station equipment | 108,501,425 | 23,349,854 | 4,712,701 | 50,480,879 | 37,899,437 | 224,944,296 | 12.36 |
| Oil tanks | 20,548,637 | 6,062,241 | 5,678,530 | 17,158,157 | 28,808,759 | 78,256,324 | 4.30 |
| Delivery facilities | — | 3,974 | 5,489,526 | 1,541,785 | 6,767,880 | 13,803,165 | 0.76 |
| Communications systems | 1,027,990 | 3,308,033 | 77,391 | 12,506,265 | 4,565,272 | 21,484,951 | 1.18 |
| Office furniture and equipment | 3,994,980 | 321,665 | 288,444 | 3,872,227 | 834,776 | 9,312,082 | 0.51 |
| Vehicles and other work equip. | 11,593,568 | 1,120,571 | 506,689 | 7,259,160 | 450,618 | 20,930,606 | 1.15 |
| Other property | — | 1,545,484 | — | — | 4,748,992 | 6,294,476 | 0.35 |
| **Total** | **$567,165,430** | **$102,629,984** | **$42,469,869** | **$491,953,849** | **$615,534,273** | **$1,819,753,404** | **100.00** |
| **PRODUCT PIPELINES INVESTMENT BY FIVE COMPANIES** | | | | | | | |
| Land | 4,434,304 | 1,763,961 | 591,807 | 1,169,417 | 3,846,831 | 11,806,320 | 0.39 |
| Right-of-way | 29,813,107 | 10,842,600 | 18,766,972 | 8,891,885 | 6,817,610 | 75,132,174 | 2.49 |
| Line pipe | 346,176,949 | 67,685,854 | 101,419,158 | 87,383,834 | 97,996,697 | 700,622,492 | 23.23 |
| Line pipe fittings | 73,542,993 | 12,961,173 | 15,460,544 | 1,743,152 | 22,311,631 | 126,929,493 | 4.21 |
| Pipeline construction | 588,032,243 | 109,853,713 | 195,066,240 | 102,037,492 | 162,229,915 | 1,157,219,603 | 38.37 |
| Buildings | 24,617,881 | 4,113,837 | 5,035,979 | 11,604,925 | 18,099,434 | 63,472,056 | 2.10 |
| Boilers | — | — | — | — | — | — | — |
| Pumping equipment | 45,231,924 | 6,166,137 | 29,148,659 | 28,990,682 | 20,472,774 | 130,010,176 | 4.31 |
| Machine tools and machinery | — | — | — | — | 501,777 | 501,777 | 0.02 |
| Other station equipment | 124,807,134 | 21,947,881 | 37,269,731 | 25,648,655 | 136,753,967 | 346,427,368 | 11.49 |
| Oil tanks | 50,505,451 | 18,197,220 | 9,079,107 | 20,262,896 | 75,943,852 | 173,988,526 | 5.77 |
| Delivery facilities | — | — | 8,445,974 | 12,957,782 | 55,550,434 | 76,954,190 | 2.55 |
| Communication systems | 2,019,811 | 646,028 | 2,453,805 | 10,863,024 | — | 15,982,668 | 0.53 |
| Office furniture and equipment | 11,243,580 | 2,662,160 | 3,264,406 | 719,294 | 1,289,649 | 19,179,089 | 0.64 |
| Vehicles and other work equip. | 8,757,496 | 2,081,707 | 8,894,689 | 3,091,836 | 2,738,110 | 25,563,838 | 0.85 |
| Other property | 73,347,765 | — | 19,129,520 | — | — | 92,477,285 | 3.07 |
| **Total** | **$1,382,440,638** | **$258,922,271** | **$454,026,591** | **$315,364,874** | **$604,552,681** | **$3,015,397,055** | **100.00** |

Source: U.S. FERC Form 6, Annual Report of Oil Pipeline Companies, Dec. 31, 1990.

element of natural gas pipelines. Costs for new land compressor stations for the most recent period ranged from a low of $607/hp for a 2,000 hp added compression at a station in New York to a high of $5,1581/hp for adding 1,100 hp of compression to a Massachusetts station. Cost per horsepower figures show no particular correlation with compressor station size or location.

### Operating costs

Once a natural gas pipeline is laid, compressor stations constructed, and meters installed, operating costs become the next consideration.

As an aid in estimating this element, transmission expenses for U.S. interstate gas pipelines for 1988 and 1989, the most recent years for which FERC has data available, have been included in an accompanying table.

Its data are based on 251,878 miles of pipeline operated and 6.4 tcf of gas sold for 1988 majors and on 254,059 miles of pipeline operated and 5.6 tcf of gas sold for 1989 majors.

- The highest component of transmission operating expenses is transmission and compression of gas by others. For majors in 1988, this component was $3,717/mile or $147/MMcf. For majors in 1989, this component was $3,363/mile or $154/MMcf.
- The second highest cost component of transmission operating expense is gas for compressor station fuel: for majors in 1988 $1,492/mile or $59/MMcf, for majors in 1989 $1,484/mile or $68/MMcf.
- The highest cost component of maintenance expense covers compressor station equipment: for majors in 1988 $866/mile or $34/MMcf, for majors in 1989 $989/mile or $45/MMcf.
- The second highest cost component for maintenance is maintenance of pipelines: for 1988 majors $435/mile or $17/MMcf, for majors in 1989 $453/mile or $21/MMcf.
- The table shows that the highest component of transmission expenses for natural gas pipelines is the operation expense: for 1988 majors $8,647/mile or $342/MMcf, for 1989 majors $8,412/mile or $384/MMcf.
- Unit maintenance expenses for 1988 majors were $1,631/mile or $64/MMcf, for 1989 majors $1,780/mile or $81/MMcf.
- During 1988, major natural gas pipeline companies spent nearly $2.2 billion for operation expenses and $410.8 million on maintenance. Total expenditures by 1988 majors for operation and maintenance expenses reached almost $2.589 billion.

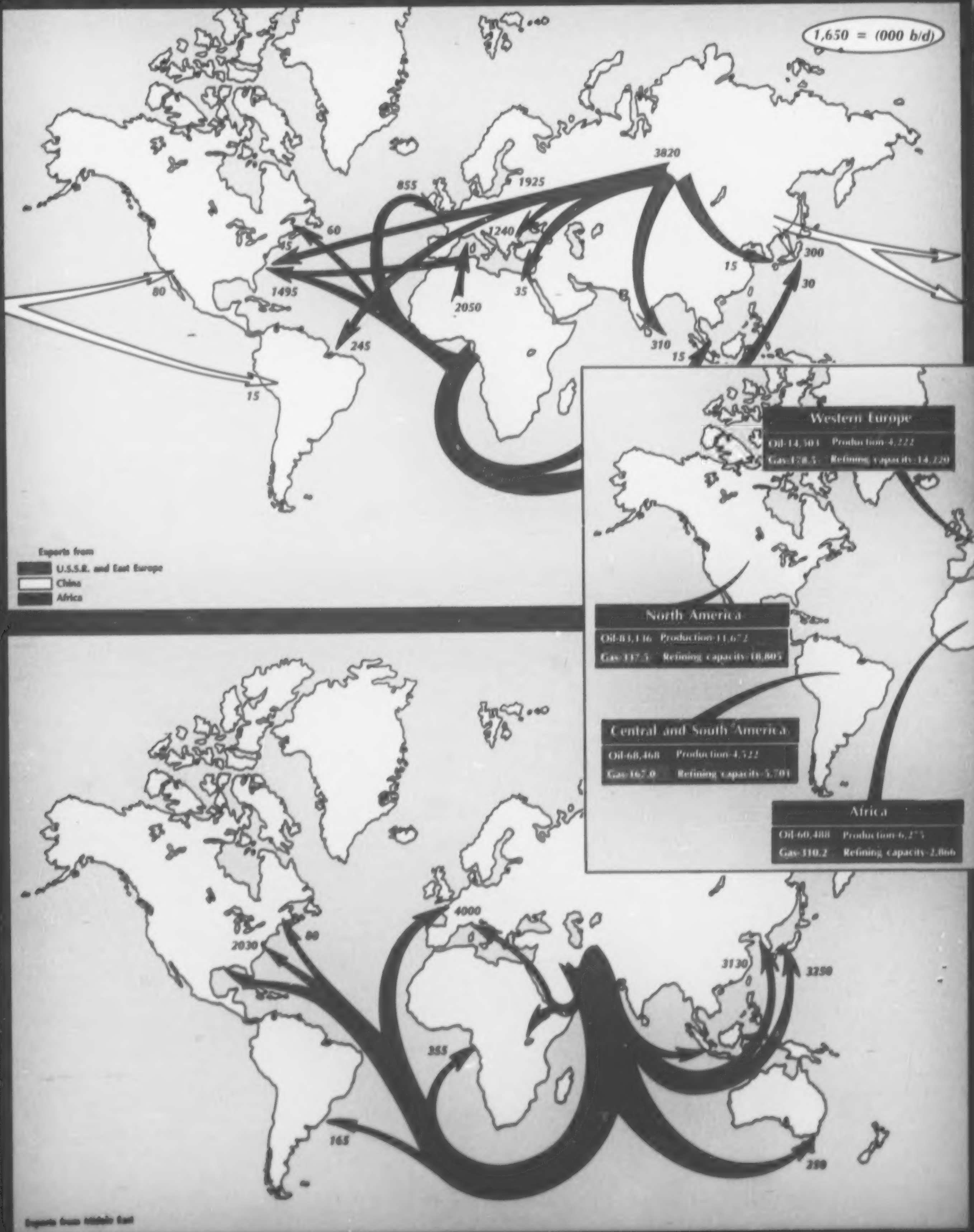
Total operation expenses for majors in 1989 fell slightly to 2.137 billion, a drop of almost $31 million or 1.4%. This followed a small drop of 2.2% from 1987 to 1988 noted in last year's International Petroleum Encyclopedia.

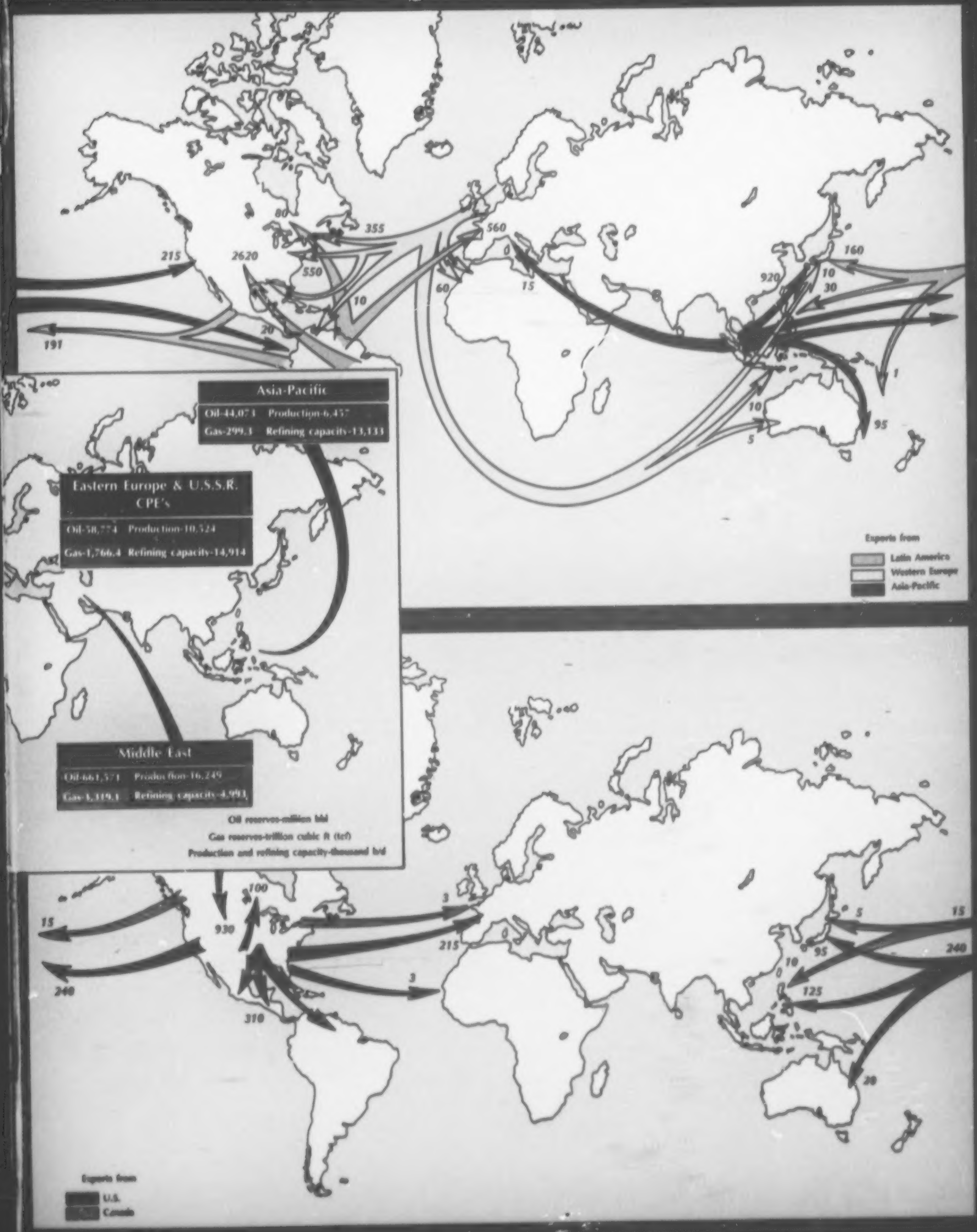
Total maintenance expenses in 1989 rose to slightly more than $452 million from a 1988 cost of $410.8 million.

Total transmission expenses showed a slight rise between 1988 and 1989. In the latter year they reached $2.589 billion.

- On a unit basis, the total 1988 transmission expense for majors was $10,278/mile or $407/MMcf of gas sold. For 1987 majors it was $10,457/mile or $402/MMcf. ■

# World 1991: Oil Production, refining capacity, oil movements, reserves.


1,650 = (000 b/d)
3820
855
1925
1240
60
45
1495
80
35
2050
245
15
15
300
30
0
310
15
15
Western Europe
Oil-14,504 Production-4,222
Gas-178.5 Refining capacity-14,220
North America
Oil-83,146 Production-11,672
Gas-137.5 Refining capacity-18,805
Central and South America
Oil-68,468 Production-4,522
Gas-167.0 Refining capacity-5,701
Africa
Oil-60,488 Production-6,275
Gas-310.2 Refining capacity-2,866
Exports from
U.S.S.R. and East Europe
China
Africa
4000
2030
80
3130
0
3250
355
165
290
Exports from Middle East


215
2620
80
355
560
550
10
60
15
20
191
920
160
10
30
1
10
95
5
Exports from
Latin America
Western Europe
Asia-Pacific
Asia-Pacific
Oil-44,073 Production-6,457
Gas-299.3 Refining capacity-13,133
Eastern Europe & U.S.S.R. CPE's
Oil-58,774 Production-10,524
Gas-1,766.4 Refining capacity-14,914
Middle East
Oil-661,571 Production-16,249
Gas-1,319.1 Refining capacity-4,993
Oil reserves-million bbl
Gas reserves-trillion cubic ft (tcf)
Production and refining capacity-thousand b/d
100
930
15
240
3
215
3
310
5
15
95
240
10
125
20
Exports from
U.S.
Canada

## Refinery throughput

| | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|---|---|---|---|---|---|---|---|---|---|---|
| | (Thousand barrels per calendar day) | | | | | | | | | |
| U.S. | 12,470 | 11,775 | 11,685 | 12,045 | 12,005 | 12,715 | 12,855 | 13,445 | 13,550 | 13,595 |
| Canada | 1,780 | 1,520 | 1,455 | 1,460 | 1,430 | 1,395 | 1,460 | 1,535 | 1,555 | 1,595 |
| Latin America | 6,700 | 6,205 | 5,955 | 5,845 | 5,585 | 5,615 | 5,665 | 5,590 | 5,750 | 5,870 |
| Western Europe | 11,385 | 10,525 | 10,165 | 10,255 | 9,950 | 10,510 | 10,380 | 10,725 | 10,760 | 11,090 |
| U.S.S.R & Central Europe | 12,210 | 12,265 | 12,255 | 12,005 | 11,725 | 11,990 | 12,030 | 12,070 | 11,950 | 11,120 |
| Middle East | 2,205 | 2,245 | 2,515 | 2,665 | 2,795 | 2,950 | 2,970 | 3,140 | 3,380 | 3,290 |
| Africa | 1,525 | 1,735 | 1,920 | 1,975 | 2,015 | 2,095 | 2,170 | 2,200 | 2,280 | 2,335 |
| China | 1,395 | 1,520 | 1,600 | 1,765 | 1,785 | 1,865 | 1,950 | 2,035 | 2,110 | 2,130 |
| Japan | 3,630 | 3,360 | 3,255 | 3,355 | 3,120 | 2,990 | 2,910 | 2,990 | 3,175 | 3,465 |
| South Asia | 795 | 840 | 880 | 885 | 1,020 | 1,120 | 1,150 | 1,160 | 1,240 | 1,245 |
| Other Asia | 2,510 | 2,365 | 2,410 | 2,485 | 2,685 | 2,800 | 2,785 | 2,915 | 3,115 | 3,320 |
| Australasia | 655 | 625 | 605 | 615 | 580 | 580 | 645 | 680 | 700 | 715 |
| **Total world** | **57,260** | **54,980** | **54,700** | **55,355** | **54,695** | **56,625** | **56,970** | **58,485** | **59,565** | **59,770** |
| Of which OECD & LDCs* | 43,500 | 41,040 | 40,685 | 41,425 | 41,015 | 42,600 | 42,815 | 44,205 | 45,235 | 46,255 |

*Organisation for Economic Cooperation and Development and lesser developed countries
Source: British Petroleum plc

## Historical reserve data (billion bbl oil)*

| | 1960 | 1970 | 1975 | 1980 | 1985 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|
| Asia-Pacific | | | | | | | | | | |
| Australia | — | 2.0 | 1.7 | 2.4 | 1.4 | 1.7 | 1.7 | 1.7 | 1.6 | 1.5 |
| Brunei | — | 1.0 | 2.0 | 1.7 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 |
| India | — | — | — | 2.5 | 3.5 | 4.3 | 6.4 | 7.5 | 7.9 | 6.1 |
| Indonesia | 9.5 | 10.0 | 14.0 | 9.5 | 8.6 | 8.4 | 8.2 | 8.2 | 11.0 | 6.6 |
| Malaysia | — | — | 2.5 | 3.0 | 3.0 | 2.9 | 2.9 | 3.0 | 2.9 | 3.0 |
| Europe | | | | | | | | | | |
| Norway | — | 1.0 | 7.0 | 5.5 | 8.3 | 14.8 | 10.4 | 11.5 | 7.6 | 7.6 |
| United Kingdom | — | 1.0 | 16.0 | 14.8 | 13.6 | 5.2 | 5.2 | 4.2 | 3.8 | 3.9 |
| Middle East | | | | | | | | | | |
| Abu Dhabi | — | 11.8 | 29.5 | 29.0 | 30.5 | 92.2 | 92.2 | 92.2 | 92.2 | 92.2 |
| Divided Zone | 6.0 | 25.7 | 6.4 | 6.0 | 5.4 | 5.2 | 5.2 | 5.2 | 5.0 | 5.0 |
| Dubai | — | — | 1.0 | 1.4 | 1.4 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Iran | 35.0 | 70.0 | 64.5 | 57.5 | 48.5 | 92.8 | 92.8 | 92.8 | 92.9 | 92.9 |
| Iraq | 27.0 | 32.0 | 34.3 | 30.0 | 44.5 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Kuwait | 62.0 | 67.1 | 68.0 | 64.9 | 90.0 | 91.9 | 91.9 | 94.5 | 94.5 | 94.0 |
| Oman | — | — | 5.0 | 2.3 | 3.5 | 4.0 | 4.0 | 4.2 | 4.3 | 4.3 |
| Qatar | 2.5 | 3.5 | 5.8 | 3.6 | 3.4 | 3.2 | 3.1 | 4.5 | 4.5 | 3.7 |
| Saudi Arabia | 50.0 | 128.5 | 148.6 | 165.0 | 169.0 | 166.9 | 169.9 | 254.9 | 257.5 | 257.8 |
| Syria | 1.0 | 1.0 | 1.0 | 1.3 | 1.4 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 |
| Yemen | — | — | — | — | — | — | — | 3.0 | 4.0 | 4.0 |
| Africa | | | | | | | | | | |
| Algeria | 5.2 | 7.0 | 7.4 | 8.2 | 9.0 | 8.5 | 8.4 | 9.2 | 9.2 | 9.2 |
| Angola-Cabinda | — | — | 1.3 | 1.2 | 1.8 | 1.1 | 2.0 | 2.0 | 2.1 | 1.8 |
| Egypt | — | 4.5 | 3.9 | 2.9 | 3.2 | 4.3 | 4.3 | 4.5 | 4.5 | 4.5 |
| Gabon | — | — | — | — | — | 0.6 | 0.7 | 0.7 | 0.7 | 0.7 |
| Libya | 2.0 | 29.2 | 26.0 | 23.0 | 21.1 | 21.0 | 22.0 | 22.8 | 22.8 | 22.8 |
| Nigeria | — | 9.3 | 20.2 | 16.7 | 16.7 | 16.0 | 16.0 | 16.0 | 17.1 | 17.9 |
| Tunisia | — | — | 1.0 | 1.7 | 1.5 | 1.8 | 1.8 | 1.8 | 1.7 | 1.7 |
| Western Hemisphere | | | | | | | | | | |
| Argentina | 2.2 | 4.5 | 2.5 | 2.5 | 2.3 | 2.3 | 2.3 | 2.3 | 2.3 | 1.6 |
| Brazil | — | — | — | 1.3 | 1.9 | 2.3 | 2.5 | 2.8 | 2.8 | 2.8 |
| Canada | — | 10.7 | 7.1 | 6.4 | 7.1 | 6.8 | 6.8 | 6.1 | 5.8 | 5.6 |
| Colombia | — | 1.7 | 1.7 | 1.0 | 0.624 | 1.6 | 2.0 | 2.0 | 2.0 | 1.9 |
| Ecuador | — | — | 2.5 | 1.1 | 1.4 | 1.6 | 1.4 | 1.5 | 1.4 | 1.6 |
| Mexico | 2.3 | 3.2 | 9.5 | 44.0 | 48.6 | 48.6 | 54.1 | 56.4 | 51.9 | 51.3 |
| Venezuela | 18.5 | 14.0 | 17.7 | 17.9 | 25.8 | 56.3 | 58.0 | 58.5 | 59.0 | 59.1 |
| U.S.A. | 33.5 | 37.0 | 33.0 | 26.4 | 27.3 | 26.3 | 26.5 | 25.9 | 26.2 | 26.3 |
| **Subtotal** | **268.5** | **511.4** | **556.7** | **562.2** | **614.6** | **808.1** | **823.6** | **917.8** | **916.3** | **932.3** |
| U.S.S.R. | 33.5 | 77.0 | 80.4 | 63.0 | 63.0 | 59.0 | 58.5 | 24.0 | 57.0 | 57.0 |
| China | — | — | — | — | 19.1 | 18.4 | 23.6 | 24.0 | 24.0 | 24.0 |
| Other | — | — | — | — | — | 1.8 | 1.7 | 1.7 | 1.8 | 1.8 |
| **Total world** | **302.0** | **611.4** | **658.7** | **648.5** | **696.7** | **887.3** | **907.4** | **1,001.6** | **999.1** | **991.8** |

*Columns do not add to totals because countries with lesser reserves are omitted.

# Increasingly stringent environmental rules shaping refining operations

The world refining industry continued efforts in 1991 to come to grips with the ultimate effects of new environmental rules that will transform it in the 1990s.

Nowhere will that test be tougher than in the U.S., coming on the heels of passage of the Clean Air Act (CAA) amendments in late 1990.

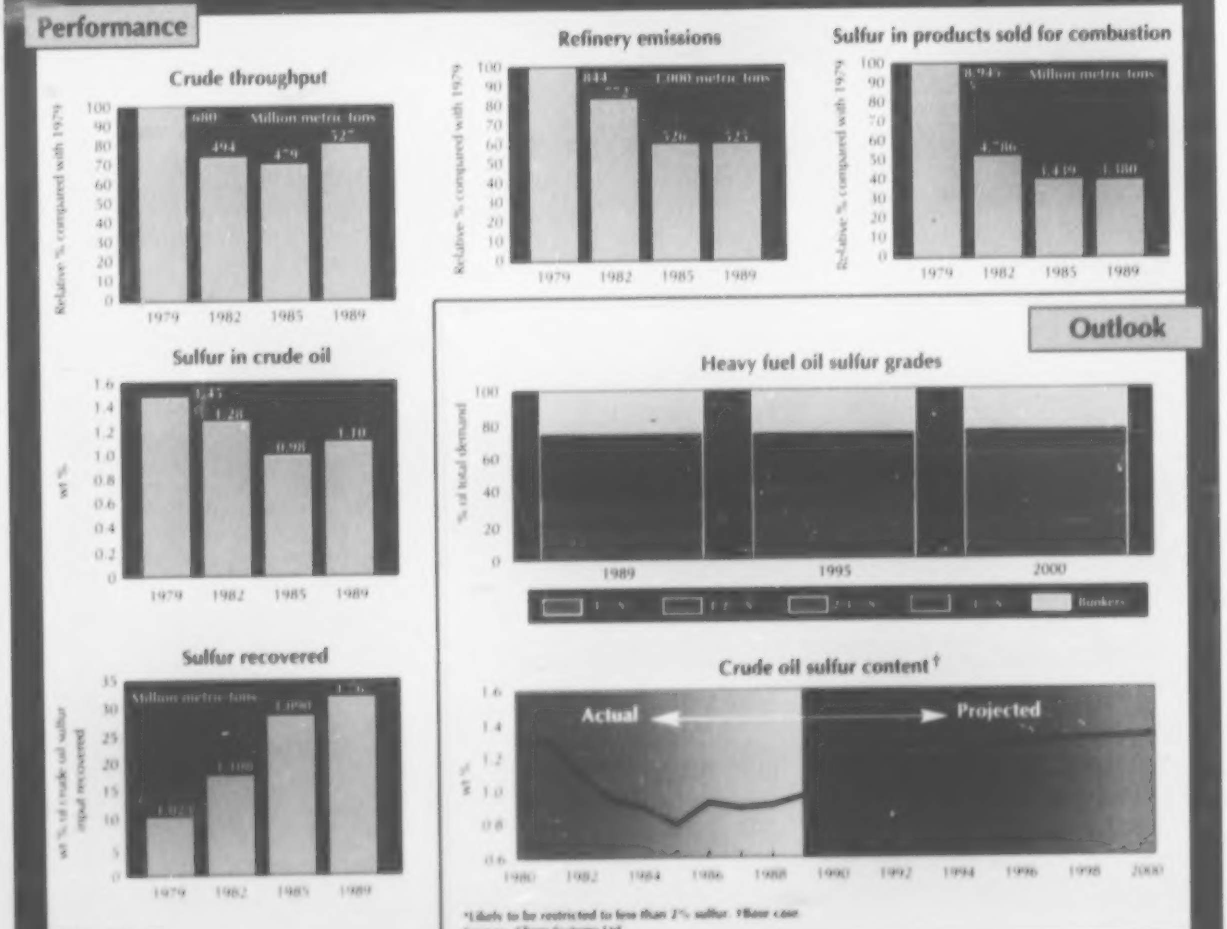
It is ironic that 1991 ended with a milestone signaling the demise of one era in refining just as the year began by ushering in a new era. Signaling that the transition to unleaded gasoline is essentially behind the industry, Jan. 1, 1992, marked the end to sales of leaded gasoline in California.

And 1991 began with U.S. refiners trying to sort out costs, timetables, and new refinery configurations to cope with changes mandated under CAA. What became increasingly clear during the year is that reformulated gasoline and new, low sulfur diesel is not likely to be limited to certain areas of the U.S., notably the worst air quality nonattainment metropolitan areas.

## U.S. reformulated gasoline outlook

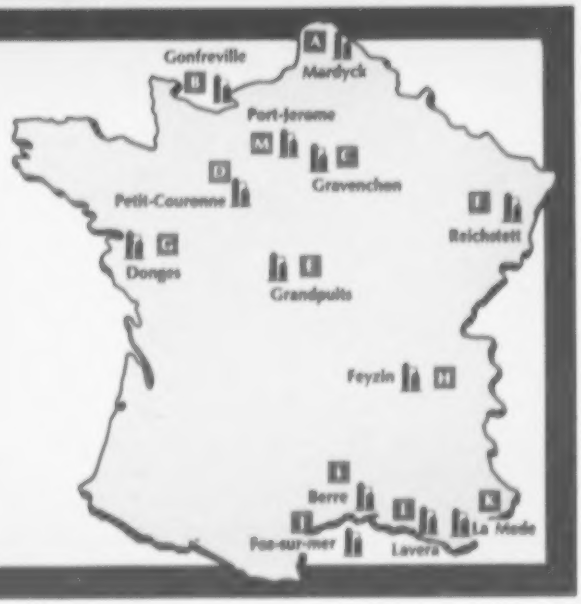
By the year 2000, it is likely that 100% of the U.S. gasoline pool will be reformulated, according to John R. Hall, chairman and chief executive officer of Ashland Oil Inc.

He notes that although only the nine worst U.S. ozone nonattainment areas will be required to have reformulated gasoline by 1995, CAA allows other nonattainment areas to opt into the program. Ashland projects that if all 96 ozone nonattainment areas opt in, 80% of the U.S. gasoline pool



Source: Concawe

*Likely to be restricted to less than 2% sulfur. †Base case.
Source: Chem Systems Ltd.



| | |
|---|---|
| A | Total France, isomerization $80.78 million, fractionation and other facilities $26.9 million |
| B | Total France, isomerization $61.04 million |
| C | Mobil Oil Francaise, isomerization $17.9 million |
| D | Shell Francaise, various projects† |
| E | Elf France, hydrotreating $17.9 million |
| F | Cie. Rhenane de Raffinage |
| G | Elf France, catalytic reforming $151.6 million |
| H | Elf France, alkylation $50.26 million, MTBE $10.77 million |
| I | Shell Francaise |
| J | Esso SAF, various projects† |
| K | Total France, isomerization $71.81 million, other projects $35.9 million |
| L | BP France, isomerization, fractionation, and other projects $143.6 million<br>Atochem/Elf, alkylation $143.6 million |
| M | Esso SAF, alkylation $107.7 million |

*1985-93 †Under consideration

will have to be reformulated.

"When demand for reformulated gasoline becomes high enough, the total pool may be reformulated due to the prohibitive cost involved in maintaining three grades of both reformulated and conventional gasoline," Hall said.

"There will of course be a major cost associated with this new gasoline."

Ashland estimates that cost at 10-15¢/gal, working out to about $9-13 billion in additional costs to consumer.

Although the exact composition of that reformulated gasoline won't be known until the U.S. Environmental Protection Agency completes a complex model required under the so-called neg-reg, or negotiated rulemaking, it is a virtual certainty gasoline will be required to have an

Table 1

**World MTBE capacity growth outlook**

| | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|---|---|---|---|---|---|---|---|
| | b/d | | | | | | |
| U.S. | 91,800 | 127,350 | 146,950 | 210,450 | 328,100 | 339,100 | 339,100 |
| Asia/Mideast | 21,238 | 24,508 | 26,508 | 52,098 | 77,438 | 131,488 | 131,488 |
| Western Europe | 52,610 | 63,040 | 63,040 | 70,770 | 82,520 | 94,270 | 94,270 |
| Eastern Europe | 6,930 | 6,930 | 6,930 | 8,330 | 16,530 | 40,030 | 58,780 |
| Canada/S.America | 2,800 | 3,740 | 15,490 | 33,990 | 41,990 | 53,740 | 53,740 |
| **Total world** | **175,378** | **225,568** | **258,918** | **375,638** | **546,578** | **658,628** | **677,378** |

Source: DeWitt & Co.

Table 2

**Asia-Pacific refining capacity outlook***

| | 1-1-91 | 1-1-96 | % change |
|---|---|---|---|
| | 1,000 b/d | | |
| Crude distillation | 10,136 | 12,117 | 20 |
| Reforming | 1,241 | 1,502 | 21 |
| Thermal cracking/ visbreaking | 388 | 394 | 2 |
| Hydrocracking | 316 | 498 | 58 |
| Catalytic cracking | 1,022 | 1,415 | 38 |

*Australia, India, Indonesia, Japan, Malaysia, New Zealand, Philippines, Singapore, South Korea, Taiwan, and Thailan.
Source: Shell International Eastern Trading Co.

Table 3

**Planned Japanese refining expansions**

| | | Capacity | |
|---|---|---|---|
| Company | Location | Existing | Planned increase |
| | | 1,000 b/d | |
| Tonen Corp. | Kawasaki | 190 | 20 |
| Kyodo Oil CL | Kashima | 150 | 20 |
| Fuji Oil CL | Sodegaura | 126 | 20 |
| Showa Shell | Yokkaochi | 235 | 60 |
| General Sekiyu | Sakai | 148 | 10 |
| Nansei Sekiyu | Nishihara | 54 | 50 |
| Nippon Petroleum Refining CL | Negishi | 306 | 55 |
| Koa Oil | Marifu | 110 | 25 |
| Nihonkai | Toyama | 44 | 14 |

oxygen content of at least 2%, reduced levels of benzene and aromatics, a likely decrease in sulfur content, and some lowering in the 90% distillation temperature, Hall contends.

The biggest question remains whether there will be adequate supplies of oxygenates to meet the needs of U.S. industry in the years to come (Table 1). The most likely oxygenate candidates are methyl tertiary butyl ether and tertiary amyl methyl ether, especially MTBE, with ethanol contributing part of the swing supply. Ashland predicts the U.S. supply of oxygenates will meet only about two thirds of expected demand. Whether there will sufficient imports to take up the slack is uncertain; it's more likely the timetable for CAA compliance will have to be extended, or the government risks the scenario of gasoline supply shortfalls and attendant price spikes.

## W. European refiners' environmental spending

In western Europe, environmental concerns will dominate refiners' agenda as well.

Tightening rules are likely to mean an end to high sulfur heavy fuel oil in western Europe's inland markets by 2000.

The outlook for bunker fuels is less clear, but the likelihood is that the maximum sulfur content for bunkers could be cut to 1.5-2%, according to a study by Chem Systems Ltd., London.

That scenario poses a dilemma for European refiners who must cope with a crude slate that features an increasingly higher average sulfur content. Chem Systems contends the resulting surplus of high sulfur residue streams, as much as 15 million metric tons/year by 2000, could force western European refiners to spend as much as $10 billion (Fig. 1).

That's beyond what Western European refiners have already accomplished in handling growing levels of sulfur in residue streams and in reducing emissions. Concawe, the European oil industry's organization

Table 5

### Refining conversion capacity changes

*In the U.S.*

| Process | Capacity 1,000 b/d | | | | Construction, 1,000 b/d | | |
|---|---|---|---|---|---|---|---|
| | As of 1-1-92 | As of 1-1-91 | % change from 1-1-91 | Vol. chg. from 1-1-91 | 1992 Completions* | Est. % chg by 1-1-93 | 1993 Completions*fe4 |
| Crude, b/cd | 15,326.6 | 15,478.9 | -1.0 | -152.3 | 126.0 | 0.82 | 135.0 |
| Feed, b/sd | | | | | | | |
| Thermal operations | 2,018.1 | 2,016.9 | 0.1 | 1.2 | 42.5 | 2.1 | 40.0 |
| Cat. reforming | 3,938.6 | 3,901.5 | 1.0 | 37.1 | 94.0 | 2.4 | 70.5 |
| Cat. cracking | 5,504.3 | 5,444.4 | 1.1 | 59.9 | 137.0 | 2.5 | 53.2 |
| Cat. Hydrocracking | 1,315.3 | 1,260.8 | 4.3 | 54.5 | 69.0 | 5.2 | 25.0 |
| Hydrorefining | 2,436.6 | 2,446.9 | -0.4 | -10.3 | 2.7 | 0.1 | 42.5 |
| Hydrotreating | 7,348.0 | 7,270.1 | 1.1 | 77.9 | 146.0 | 2.0 | 442.6 |
| Products, b/sd | | | | | | | |
| Alkylation | 1,096.1 | 1,072.4 | 2.2 | 23.7 | 4.0 | 0.4 | 7.0 |
| Aromatics/Isom. | 847.8 | 836.3 | 1.4 | 11.5 | 20.0 | 2.4 | 7.0 |
| Lubes | 216.6 | 224.7 | -3.6 | -8.1 | 2.3 | 1.1 | 0.0 |
| Coke, 1,000 tons/d | 77.2 | 77.5 | -0.4 | -0.3 | 0.8 | 1.0 | 0.0 |
| Asphalt | 769.8 | 748.7 | 2.8 | 21.1 | 0.0 | 0.0 | 0.0 |

*Based on reported projects known to date.

*In the EEC*

| Process | Capacity 1,000 b/d | | | | Construction, 1,000 b/d | | |
|---|---|---|---|---|---|---|---|
| | As of 1-1-92 | As of 1-1-91 | % change from 1-1-91 | Vol. chg. from 1-1-91 | 1992 Completions* | Est. % chg by 1-1-93 | 1993 Completions*fe4 |
| Crude, b/cd | 12,192.7 | 12,184.1 | 0.1 | 8.6 | 94.5 | 0.78 | 97.0 |
| Feed, b/sd | | | | | | | |
| Thermal operations | 1,673.6 | 1,613.5 | 3.7 | 60.1 | 3.6 | 0.2 | 10.0 |
| Cat. reforming | 1,918.1 | 1,900.2 | 0.9 | 17.9 | 149.5 | 7.8 | 94.0 |
| Cat. cracking | 1,824.6 | 1,800.5 | 1.3 | 24.1 | 71.7 | 3.9 | 22.5 |
| Cat. Hydrocracking | 414.8 | 399.9 | 3.7 | 14.9 | 56.8 | 13.7 | 37.0 |
| Hydrorefining | 1,741.5 | 1,732.6 | 0.5 | 8.9 | 12.0 | 0.7 | 6.5 |
| Hydrotreating | 4,082.0 | 3,894.4 | 4.8 | 187.6 | 140.6 | 3.4 | 110.0 |
| Products, b/sd | | | | | | | |
| Alkylation | 182.0 | 171.3 | 6.3 | 10.7 | 17.0 | 9.3 | 16.7 |
| Aromatics/Isom. | 379.5 | 341.4 | 11.1 | 38.1 | 49.2 | 13.0 | 27.5 |
| Lubes | 136.0 | 132.7 | 2.5 | 3.3 | 3.8 | 2.8 | 5.9 |
| Coke, 1,000 tons/d | 8.2 | 8.3 | -0.4 | -0.0 | 0.0 | 0.0 | 0.8 |
| Asphalt | 357.4 | 391.1 | -8.6 | -33.7 | 13.7 | 3.8 | 0.0 |

*Based on reported projects known to date.
Europe includes Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain and United Kingdom.

*In the Asia-Pacific region*

| Process | Capacity 1,000 b/d | | | | Construction, 1,000 b/d | | |
|---|---|---|---|---|---|---|---|
| | As of 1-1-92 | As of 1-1-91 | % change from 1-1-91 | Vol. chg. from 1-1-91 | 1992 Completions* | Est. % chg by 1-1-93 | 1993 Completions*fe4 |
| Crude, b/cd | 13,195.0 | 12,603.0 | 4.7 | 592.0 | 447.5 | 3.39 | 488.0 |
| Feed, b/sd | | | | | | | |
| Thermal operations | 518.4 | 565.7 | -8.3 | -47.2 | 13.0 | 2.6 | 10.0 |
| Cat. reforming | 1,273.3 | 1,168.8 | 8.9 | 104.5 | 188.0 | 14.8 | 134.1 |
| Cat. cracking | 1,095.0 | 1,060.3 | 3.3 | 34.7 | 175.2 | 16.0 | 20.5 |
| Cat. Hydrocracking | 398.7 | 354.7 | 12.4 | 44.0 | 89.2 | 22.4 | 37.0 |
| Hydrorefining | 1,887.0 | 1,667.3 | 13.2 | 219.7 | 12.0 | 0.6 | 6.5 |
| Hydrotreating | 3,171.5 | 3,354.8 | -5.5 | -183.3 | 230.4 | 7.3 | 137.2 |
| Products, b/sd | | | | | | | |
| Alkylation | 85.8 | 79.3 | 8.2 | 6.5 | 16.6 | 19.4 | 12.0 |
| Aromatics/Isom. | 213.1 | 135.1 | 57.7 | 78.0 | 24.7 | 11.6 | 26.7 |
| Lubes | 106.9 | 112.5 | -5.0 | -5.6 | 5.8 | 5.4 | 157.1 |
| Coke, 1,000 tons/d | 3.6 | 3.8 | -5.3 | -0.2 | 0.0 | 0.0 | 0.8 |
| Asphalt | 173.1 | 211.1 | -18.0 | -38.0 | 17.7 | 10.2 | 0.0 |

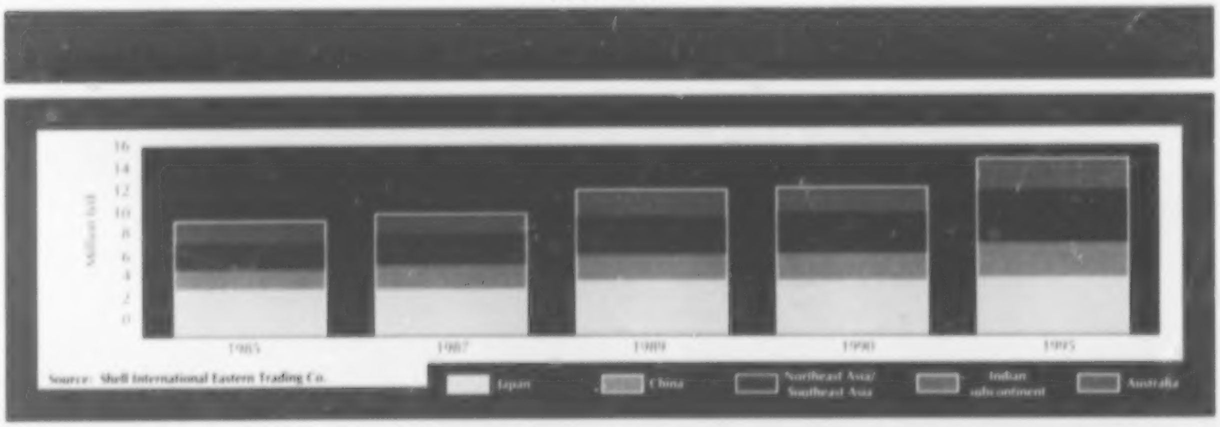
*Based on reported projects known to date.
Asia/Pacific includes Australia, Bangladesh, Brunei, China, India, Indonesia, Japan, Korea, Malaysia, Myanmar, New Zealand, Pakistan, Philippines, Singapore, Taiwan and Thailand.

Table 4

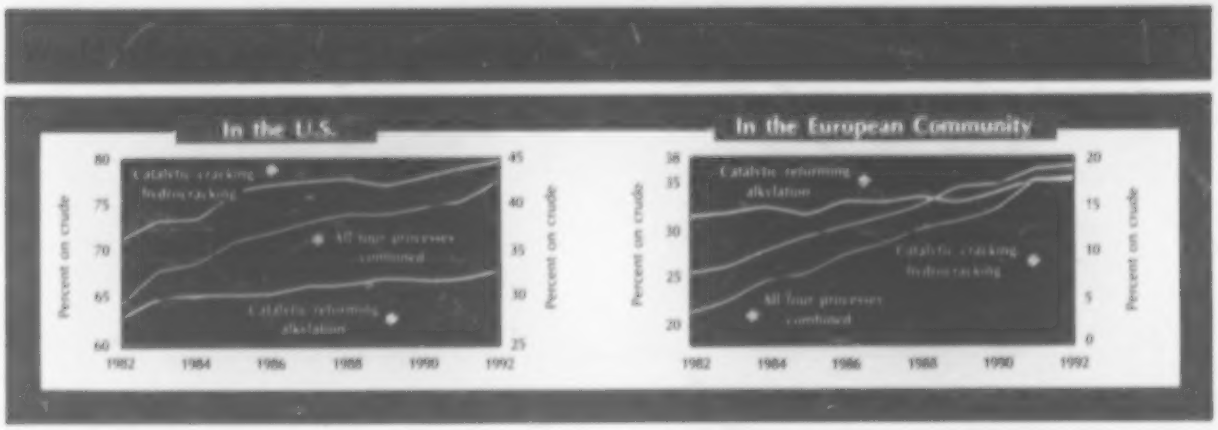
### Worldwide refining by region, 1-1-92

| Region | No. of Ref. | Crude b/cd | Vacuum distillation b/cd | Catalytic cracking b/cd | Catalytic reforming b/cd | Catalytic hydrocracking b/cd | Catalytic hydrorefining b/cd | Coke t/d |
|---|---|---|---|---|---|---|---|---|
| Asia-Pacific | 120 | 13,195,035 | 3,127,605 | 1,094,995 | 1,273,253 | 398,680 | 1,886,980 | 3,600 |
| Western Europe | 118 | 14,220,408 | 5,210,316 | 2,002,654 | 2,211,193 | 486,840 | 1,801,840 | 8,289 |
| Eastern Europe & U.S.S.R. | 81 | 14,911,835 | 768,995 | 225,310 | 283,954 | 25,834 | 214,720 | 2,677 |
| Middle East | 39 | 4,992,894 | 1,541,095 | 204,041 | 527,486 | 469,080 | 469,207 | 2,430 |
| Africa | 44 | 2,886,103 | 378,402 | 172,700 | 329,987 | 36,200 | 122,000 | 941 |
| North America | 228 | 18,805,606 | 8,450,180* | 6,149,970* | 4,497,470* | 1,514,940* | 2,798,100* | 78,207 |
| South America/Caribbean | 75 | 5,980,675 | 2,577,327 | 955,635 | 340,700 | 109,500 | 344,900 | 1,000 |
| Total all Regions | 705 | 74,992,556 | 22,053,920 | 10,805,305 | 9,464,043 | 3,016,074 | 7,775,887 | 97,144 |

*U.S. data in bsd.



Source: Shell International Eastern Trading Co.



for environmental health and protection, estimates sulfur in products sold for combustion from 83 refineries that account for most of western European crude oil throughput fell by 62% during 1979-89. Comparable declines were seen in refinery sulfur emissions, while sales of elemental sulfur to the chemical industry about tripled in the period (Fig. 1).

Perhaps nowhere in western Europe are environmental spending plans more ambitious than in France. French refiners face especially tough challenges to meet tightening gasoline and diesel specifications and increased environmental pressures. During 1985-93, French refiners will have spent almost 6 billion francs ($1.077 billion) just to meet a rapidly growing demand for unleaded gasoline (Fig. 2).

At least that much more will have to be spent in 1993-96 to supply more middle distillates with reduced sulfur content to meet more stringent quality requirements from the European Community.

All of this pales in comparison with what industry will have to spend during the 1990s and beyond to upgrade, expand, and modernize the refining sector of the formerly Communist nations of eastern Europe. Industry has yet to get a handle on the costs of cleaning up and bringing up to western standards the crumbling refining infrastructure of eastern Europe, but they are certain to be huge.

### Asia-Pacific refining growth spurt

The Asia-Pacific refining will continue to be the most dynamic growth sector in world refining in the 1990s.

Especially strong growth will be seen in the booming "tiger" economies of Singapore, Malaysia, Thailand, South Korea, and Taiwan, with huge outlays planned for new distillation capcity to meet increases in overall demand for refined products as well as for refinery upgrades to meet growing demand for lighter products. Royal Dutch/Shell Group predicts addition of 2-2.5 million of refining capacity in the region (Table 2), with the biggest relative growth among the "tiger" economies (Fig. 3).

The region's yield of about 70% light products is expected to rise to 80% by 1995 to accommodate expected demand. Major increases in upgrading capacity are planned in Malaysia South Korea.

A push by Japanese refiners to add distillation capacity will result in a slight decline in percentage of upgrading to primary distillation capacity (Table 3).

Table 6

**U.S. hydroprocessing**

| | Capacity 1-1-92 1,000 b/d | Capacity 1-1-91 1,000 b/d | % Change |
|---|---|---|---|
| Hydrorefining | | | |
| Resid & heavy gas oil | 916.8 | 779.8 | 17.6 |
| FCC & cycle stock pretreatment | 1,048.5 | 1,170.5 | -10.4 |
| Mid distillate | 397.5 | 437.3 | -9.1 |
| Other | 73.6 | 59.3 | 24.5 |
| Hydrotreating | | | |
| Cat. reformer feed & naphtha desulfurization | 3,830.4 | 3,851.8 | -0.5 |
| Straight run distillate | 1,576.2 | 1,546.4 | 1.9 |
| Other distillate & material | 1,461.0 | 1,400.3 | 4.3 |
| Lube oil polishing | 225.3 | 221.2 | 1.9 |
| Naphtha olefin & aromatics saturation | 155.2 | 150.4 | 3.2 |

### Worldwide refining capacity changes in 1991

The worldwide refining industry boosted capacity in

Table 7

## Breakout of large refiners' operations

*U.S. Companies*

| Rank | Company | No. of refineries | Crude capacity b/cd | Crude capacity b/sd | Cat. cracking fresh feed, b/sd | Cat. reforming, b/sd | Hydro-cracking, b/sd | Hydro-refining/ hydro-treating, b/sd* | Alkylation, b/sd | Coking, b/sd† |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Chevron U.S.A. | 11 | 1,466,100 | 1,580,500 | 423,000 | 334,800 | 245,500 | 687,100 | 80,400 | 178,800 |
| 2. | Exxon Co. | 8 | 1,227,650 | 1,285,090 | 604,000 | 280,200 | 82,900 | 682,900 | 102,100 | 156,400 |
| 3. | Shell Oil Co. | 7 | 1,096,200 | 1,142,000 | 319,500 | 298,000 | 161,500 | 507,300 | 77,000 | 95,000 |
| 4. | Amoco Oil Co. | 6 | 962,000 | 1007,500 | 416,500 | 279,900 | 120,000 | 378,600 | 99,400 | 61,500 |
| 5. | Mobil Oil Corp. | 5 | 838,000 | 902,000 | 357,000 | 255,500 | 71,700 | 421,560 | 80,500 | 169,500 |
| 6. | BP Oil Co. | 5 | 742,900 | 782,000 | 256,500 | 200,900 | 80,000 | 148,000 | 64,300 | 52,000 |
| 7. | Star Enterprise | 3 | 615,000 | 690,000 | 280,000 | 142,000 | 90,000 | 283,900 | 46,000 | 45,000 |
| 8. | Marathon Oil Co. | 5 | 586,000 | 608,000 | 211,000 | 160,500 | 24,000 | 161,000 | 61,300 | 22,000 |
| 9. | Sun Refining & Marketing Co. | 4 | 515,000 | 545,000 | 217,000 | 143,600 | 56,200 | 111,900 | 32,800 | 0 |
| 10. | CITGO | 2 | 452,500 | 466,000 | 226,500 | 160,000 | 45,000 | 213,700 | 42,200 | 121,500 |
| 11. | ARCO | 4 | 419,500 | 440,500 | 82,000 | 104,000 | 74,000 | 119,000 | 14,000 | 106,000 |
| 12. | Conoco Inc. | 5 | 406,500 | 424,000 | 133,500 | 86,700 | 0 | 207,300 | 25,500 | 80,500 |
| 13. | Texaco Refining & Marketing Inc. | 4 | 356,400 | 375,000 | 112,500 | 118,500 | 40,300 | 157,000 | 29,300 | 126,000 |
| 14. | Ashland Petroleum Co. | 3 | 346,500 | 357,220 | 148,000 | 86,500 | 0 | 194,000 | 24,500 | 0 |
| 15. | Koch Refining Co. | 2 | 343,500 | 360,000 | 95,000 | 80,500 | 0 | 117,500 | 16,900 | 70,000 |
| 16. | Phillips 66 Co. | 3 | 305,000 | 331,000 | 155,400 | 68,000 | 0 | 216,600 | 31,100 | 0 |
| 17. | Phibro Refining Inc. | 4 | 275,500 | 291,700 | 139,000 | 48,500 | 0 | 59,000 | 14,500 | 0 |
| 18. | Coastal Refining and Marketing Inc. | 6 | 274,075 | 288,500 | 102,000 | 76,500 | 10,000 | 84,800 | 12,800 | 17,500 |
| 19. | Unocal Corp. | 2 | 221,100 | 232,400 | 47,000 | 86,000 | 61,500 | 64,500 | 10,000 | 46,900 |
| | Total | 89 | 11,470,425 | 12,106,380 | 4,336,400 | 3,024,400 | 1,164,600 | 4,615,660 | 864,600 | 1,268,400 |

*Excludes pretreating cat. reformer feed, naphtha desulfurization, and naphtha, olefin, or aromatics saturation.
†Includes fluid and delayed Coking.

*European Companies*

| Rank | Company | No. of refineries | Crude capacity, b/cd | Cat. cracking, b/cd | Cat. reforming, b/cd | Hydro-cracking, b/cd | Hydro-refining hydro-treating, b/cd* | Alkylation, b/cd | Coking b/cd† |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Royal Dutch/Shell | 8 | 1,306,000 | 210,000 | 260,000 | 63,000 | 300,300 | 15,100 | 0 |
| 2. | ESSO Corp | 8 | 1,184,000 | 180,400 | 190,300 | 0 | 550,600 | 23,200 | 19,900 |
| 3. | Agip Petroli | 8 | 1,033,000 | 180,300 | 118,550 | 0 | 228,300 | 23,800 | 45,000 |
| 4. | Total Cie Frac. des Petroleum | 6 | 797,000 | 104,760 | 124,200 | 31,000 | 198,200 | 2,400 | 0 |
| 5. | Repsol Petroleo SA | 4 | 570,000 | 58,000 | 81,000 | 15,000 | 0 | 0 | 29,500 |
| 6. | British Petroleum Corp. | 6 | 496,130 | 66,000 | 73,960 | 46,440 | 72,640 | 4,200 | 0 |
| 7. | Elf Aquitaine | 4 | 464,000 | 110,000 | 57,000 | 0 | 112,200 | 7,900 | 0 |
| 8. | Motor Oil (Hellas) Corinth Refineries SA | 1 | 460,000 | 60,000 | 58,000 | 0 | 119,000 | 7,250 | 0 |
| 9. | Petrofina SA | 2 | 349,500 | 76,500 | 59,200 | 0 | 80,800 | 6,150 | 0 |
| 10. | Ertoil SA | 1 | 302,400 | 76,500 | 57,800 | 0 | 121,630 | 0 | 0 |
| 11. | Petrogal | 3 | 294,300 | 10,100 | 51,000 | 9,400 | 39,800 | 0 | 0 |
| 12. | Cia. Espanola de Petroleo | 2 | 290,000 | 36,000 | 49,000 | 0 | 59,000 | 0 | 0 |
| 13. | Saras SpA | 1 | 285,000 | 72,000 | 27,000 | 0 | 75,500 | 6,800 | 0 |
| 14. | Mobil Oil Corp. | 3 | 250,000 | 47,800 | 41,500 | 0 | 69,300 | 2,200 | 0 |
| 15. | Petronor SA | 1 | 240,000 | 40,000 | 33,500 | 0 | 75,000 | 0 | 0 |
| 16. | Kuwait Petroleum Corp. | 3 | 234,000 | 0 | 46,500 | 46,000 | 71,300 | 0 | 0 |
| 17. | PCK Schwedt AG | 1 | 230,000 | 37,000 | 41,000 | 0 | 95,160 | 5,500 | 0 |
| 18. | Irish Refining Petroleum Corp. Ltd. | 1 | 220,000 | 0 | 34,500 | 59,000 | 86,000 | 0 | 0 |
| 19. | Ruhr Oel GmbH | 1 | 215,400 | 0 | 38,900 | 30,000 | 63,000 | 0 | 26,000 |
| 20. | Sarpom | 1 | 210,000 | 18,000 | 27,000 | 0 | 43,000 | 0 | 0 |
| 21. | Eastham Refinery Ltd. | 1 | 200,000 | 66,000 | 25,600 | 0 | 39,600 | 3,700 | 0 |
| | TOTAL | 65 | 9,830,730 | 1,421,360 | 1,486,510 | 300,840 | 2,498,130 | 108,200 | 122,400 |

*Excludes pretreating cat. reformer feed, naphtha desulfurization, and naphtha, olefin, or aromatics saturation.
†Includes fluid and delayed Coking.
European countries include Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain and United Kingdom.

most key downstream processing categories in 1991.

However, distillation capacity remained basically flat at just under 75 million b/cd during the year (Table 4).

Again, the Asia-Pacific sector's increase in crude capacity was offset by a slight decline in the U.S. and a negligible rise in the European Economic Community (EEC) (Table 5).

Because of its automobile dominated transportation system, the U.S. still has the world's biggest and most complex refining industry. The U.S. ratio of capacity of key downstream gasoline producing and conversion units to crude distillation capacity is more than twice that of the EEC. That comparison also holds with the Asia-Pacific sector.

However, the U.S. edge is slipping, as both sectors implement massive downstream conversion and octane capacity programs.

### U.S. refining capacity changes

In the U.S., refineries continued a trend of increased processing capability in 1991.

U.S. distillation capacity of 15.3 million b/cd as of Jan. 1, 1992, represents the lowest level since 1987. The peak was in 1980 at 18.5 million b/cd.

Although the U.S. refining sector registered slight decreases in crude and vacuum distillation capacities—due essentially to the closure of two refineries—there were sizable increases in conversion capacity in 1991.

The biggest gains were:

- Valero hiked its catalytic reforming and catalytic hydrocracking capacities at its Corpus Christi, Tex., refinery.
- Star Enterprise—the 50-50 joint venture of Saudi Aramco and Texaco Inc.—jumped capacities of cat cracking and hydrocracking at its Port Arthur, Tex., plant.
- Chevron increased capacity of cat hydrocracking at its Richmond, Calif., refinery.

Aside from the declines in crude and vacuum distillation capacities, U.S. refiners also logged slight declines in capacities of catalytic hydrorefining, lubes, and coking.

A key trend is the emphasis on heavier materials in U.S. primary hydroprocessing capacity increases (Table 6).

Among big refiners in the U.S., the most noteworthy change was the big increase in capacity for Citgo Petroleum Corp., courtesy of its acquisition of Champlin Refining & Chemicals Inc.'s 130,000 b/d refinery at Corpus Christi (Table 7). And the proportion of U.S. crude distillation capacity held by big refiners continued its decline in 1991 (Table 8).

### Other capacity changes in 1991

EEC refiners continued their momentum of recent years toward increased processing capability.

However, growth of cracking capacities in western Europe has outpaced that of octane related capacities the past 10 years. Big refiners hold 60% of the crude distillation capacity in the EEC, or 65 out of a total 108 refineries.

A noteworthy change to the EEC list of big refiners is the addition of a former east German refinery, PCK Schwedt, by virtue of its purchase of a European group led by Veba Oel.

In the Asia Pacific region, refiners in 1991 increased capacities for all major processes, expect for coke, lubes, and asphalt.

### Refinery shutdowns

The marginal increase in world crude distillation capacity in 1991 came despite some significant refinery shutdowns.

Chevron U.S.A. Inc. closed its 22,000 b/cd Kenai, Alas., refinery, citing marginal profits and the cost of compliance with Alaska's new requirement for Cook Inlet refiners preparing an oil spill response preparedness program. The Kenai plant was dismantled in June 1991.

**Table 8**

**Big refiners' U.S. market share**

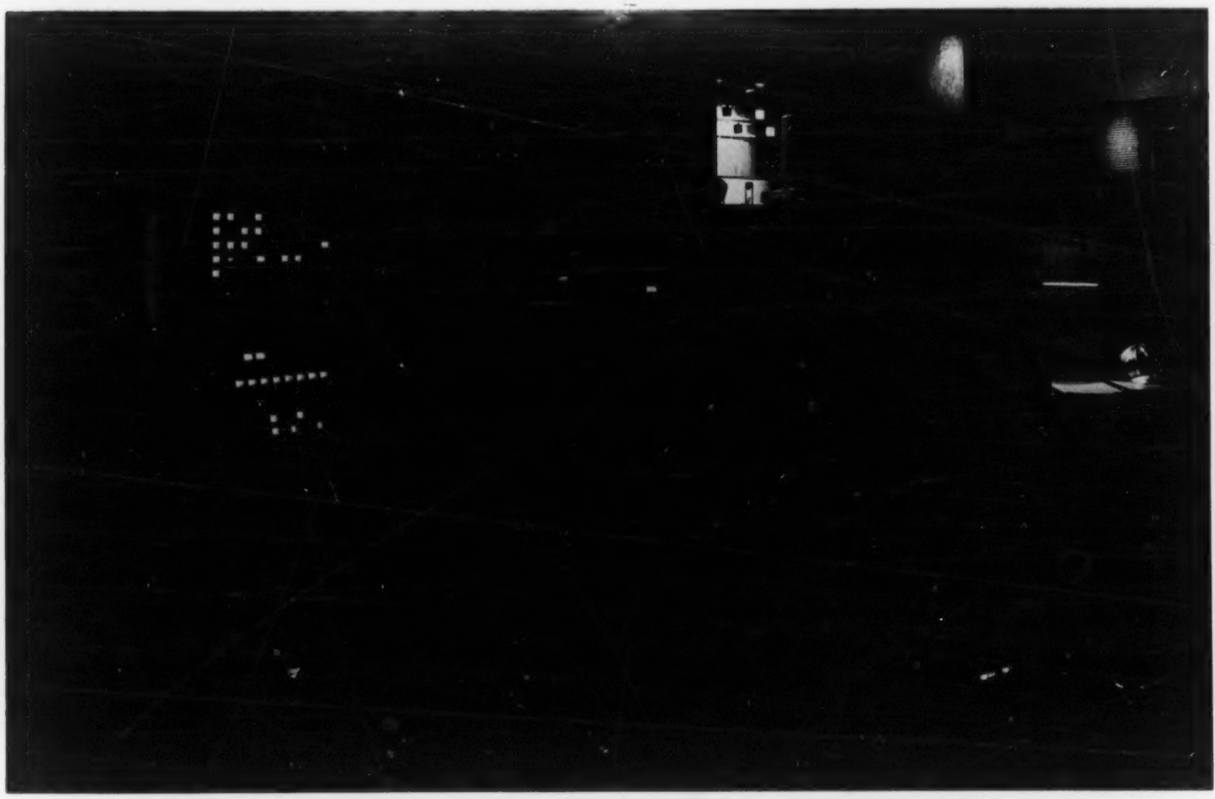
| | Companies with 200,000+ b/cd crude capacity 1-1-92 | 1-1-91 | Companies with less than 200,000 b/cd crude capacity 1-1-92 | 1-1-91 |
|---|---|---|---|---|
| No. Companies | 19 | 19 | 89 | 92 |
| No. Refineries | 89 | 88 | 101 | 106 |
| Crude Capacity, b/cd | 11,470,425 | 11,692,275 | 3,478,181 | 3,786,674 |
| Crude Capacity, b/sd | 12,106,350 | 12,295,520 | 3,678,880 | 4,008,434 |
| % U.S. capacity (b/cd basis) | 76.7 | 75.5 | 23.3 | 24.5 |
| Cat. cracking (FF), b/sd | 4,338,400 | 4,299,900 | 1,005,900 | 1,144,500 |
| % on crude | 35.8 | 35.0 | 27.3 | 28.6 |
| Cat. Reforming, b/sd | 3,024,400 | 3,083,000 | 747,370 | 818,520 |
| % on crude | 25.0 | 25.1 | 20.3 | 20.4 |
| Hydrocracking, b/sd | 1,164,600 | 1,134,600 | 147,500 | 126,190 |
| % on crude | 9.6 | 9.2 | 4.0 | 3.1 |
| Hydrorefining & hydrotreating, b/sd* | 4,815,650 | 4,797,150 | 641,400 | 817,650 |
| % on crude | 39.8 | 39.0 | 17.4 | 20.4 |
| Alkylation, b/sd | 864,600 | 835,700 | 204,040 | 240,000 |
| % on crude | 7.1 | 6.8 | 5.5 | 6.0 |
| Coking, b/sd† | 1,368,400 | 1,376,200 | 210,300 | 239,100 |
| % on crude | 11.3 | 11.2 | 5.7 | 6.0 |

*Excludes pretreating cat. reformer feed, naphtha, desulfurization and naphtha, oelfin or aromatics saturation.
†Includes fluid and delayed Coking.

Amoco Oil Co. closed its Casper, Wyo., refinery, citing the high costs of complying with U.S. environmental costs.

Late in the year, Farmland decided to shut down its 27,500 b/d Phillipsburg, Kan., refinery because of unprofitability of asphalt sales and the costs associated with needed environmental improvements. The closure is slated for Apr. 30, 1992.

Expected to add to the list of closures at least in part is a



*Control room at Gulf Oil Refining Ltd.'s Milford Haven, Wales, refinery was redesigned by Crabtree Hall Projects Ltd., London, to improve efficiency and productivity. More such projects are likely in the 1990s as refiners try to stay profitable while coping with changing product trends and tougher environmental rules.*

Table 9

## Worldwide oxygenates capacity

| Country | Company | Location | MTBE | TAME |
|---|---|---|---|---|
| United States | Amerada Hess Corp. | Port Reading, N.J. | 1,200 | |
| United States | Amoco Oil Co. | Whiting, Ind. | 4,000 | |
| United States | Amoco Oil Co. | Yorktown, Va. | 800 | |
| United States | ARCO | Channelview, Tex. | 30,000 | |
| United States | Ashland Petroleum Co. | Catlettsburg, Ky. | 3,200 | |
| United States | Atlantic Richfield Co. | Carson, Calif. | 2,400 | |
| United States | Chevron U.S.A. Inc. | El Segundo, Calif. | 2,300 | |
| United States | Citgo Petroleum Corp. | Lake Charles, La. | 2,100 | |
| United States | Citgo Petroleum Corp. | Corpus Christi, Tex. | 1,900 | |
| United States | Coastal Refining & Marketing Inc. | Corpus Christi, Tex. | 12,000 | |
| United States | Conoco Inc. | Ponca City, Okla. | 500 | |
| United States | Crown Central Petroleum Corp. | Houston, Tex. | 5,000 | |
| United States | Diamond Shamrock Refining & Marketing Co. | Sunray, Tex. | 1,810 | |
| United States | Exxon Chemical | Baytown, Tex. | 3,000 | |
| United States | Lyondell Petrochemical Co. | Houston, Tex. | 2,100 | |
| United States | Marathon Oil Co. | Robinson, Ill. | 1,450 | 250 |
| United States | Marathon Oil Co. | Detroit, Mich. | 1,100 | |
| United States | Mobil Oil Corp. | Beaumont, Tex. | 2,200 | |
| United States | Phibro Refining Inc. | Houston, Tex. | 1,300 | |
| United States | Phillips 66 Co. | Sweeny, Tex. | 3,000 | |
| United States | Sun Refining & Marketing Co. | Marcus Hooks, Pa. | 2,600 | |
| United States | Texas Petrochemical Corp. | Houston, Tex. | 9,600 | |
| United States | Valero Refining Co. | Corpus Christi, Tex. | 1,900 | |
| | **Total** | | **95,460** | **250** |

| Country | Company | Location | MTBE | TAME |
|---|---|---|---|---|
| Austria | OMV Akiengesellschaft | Schwechat | 1,300 | |
| Belgium | Fine Raffinaderij Antwerpen | Antwerp | 4,500 | |
| Brazil | Copene | Camacari, Bahia | 1,400 | |
| Czechoslovakia | Kaucuk sp. | Kralupy | 2,000 | |
| France | Arco Chemical | Fos-sur-Mer | 14,500 | |
| Germany | DEA Aktiengesellschaft | Heide | 280 | |
| Germany | Leuna-Werke AG | Leuna | 2,150 | |
| Greece | Hellenic Aspropyrgos Refinery SA | Aspropyrgos | 1,600 | |
| Italy | Agip Raffinazione Spa | Sannazzaro (Pavia) | 920 | |
| Italy | Raffineria Mediterranea Spa | Milazzo | 1,400 | |
| Italy | Praoil | Gela | 1,100 | |
| Italy | Praoil | Priolo | 1,050 | |
| Netherlands | Arco Chemie Nederland Ltd. | Rotterdam | 11,900 | |
| Netherlands | DSM - Methanor VoF | South Limburg | 2,750 | |
| Netherlands | Shell Nederland chemie BV | Pernis | 2,550 | |
| Poland | Masovian Refinery & Petrochemical Works | Plock | 1,600 | |
| Spain | Cia Espanola de Petroles | San Roque (Cadiz) | 1,125 | |
| United Kingdom | Lindsey Oil Refinery Ltd. | Killingholm, South Humberside | 2,400 | 1,300 |
| Venezuela | Super Octanos | Jose, Edo. Anzoategui | 10,200 | |
| | **Total** | | **65,725** | **1,300** |

the top of the list is a 350,000 b/d refinery at Huian, Fujian province, planned for completion in 1994. Sinochem also was to complete construction by yearend on a 20,000 b/d plant at Erliand, Inner Mongolia, and plans a 20,000 b/d unit at Golmud, Qinghai-Tibet, for completion in mid-1995 at a cost of $88 million.

Indonesia's state owned Pertamina is building a 125,000 b/d refinery at Balongan, West Java.

Pilipinas Shell Petroleum Corp. is building a 38,000 b/d refinery at Tabangao, Batangas, Philippines, due to start up in 1994.

Significant expansions also are under way in the Asia-Pacific region.

Kyung In Energy Co. Ltd. was expected to start up by yearend 1991 its new 150,000 b/d crude unit at its Inchon, South Korea, refinery. It also plans to add a 20,000 b/d vacuum distillation unit in 1992.

Partly state owned Thai refiner Bangchak Petroleum Co. Ltd. is adding a 40,000 b/d crude unit, 7,006 b/d reformer, 13,800 b/d naphtha hydrodesulfurization unit, and a 3,000 b/d Merox unit.

Taiwan's state owned Chinese Petroleum Corp. is expanding crude units by 91,700 b/d at Kaohsiung, 100,000 b/d at Talin Pu, and 64,200 b/d at Tao-yuan, all scheduled for completion by mid-1993.

In Thailand, Thai Oil Co. Ltd. is expanding crude distillation capacity at its Sri Racha refinery by 100,000 b/d and adding a 23,900 b/d platformer, 32,900 b/d naphtha hydrodesulfurization unit, and a 19,000 b/d kerosine Merox unit. All are to start up in 1992.

In South Korea, Yukong Ltd. expects to complete work in 1992 on a 63,000 b/d vacuum distillation unit, a 30,000 b/d hydrocracker, and a 30,000 b/d residuum hydrodesulfurization unit.

### Other Eastern Hemisphere refinery construction

OPEC members dominate the refinery construction scene in the Eastern Hemisphere outside the Far East.

National Iranian Oil Co. is building a $1.8 billion, 150,000 b/d refinery at Arak, Iran, that is expected to be complete by December 1992. NIOC also plans to construct a 230,000 b/d refinery at Bandar Abbas along the Strait of Hormuz. Included in the Bandar Abbas project are a 36,000 b/d platformer, 36,000 b/d naphtha hydrodesulfurization unit, and a 25,000 b/d kerosine hydrodesulfurization unit.

In Italy, Saras SpA is building a 100,000 mild hydrocracker at its Sarroch refinery. And Agip Petroli is adding a 20,000 b/d resid hydroconversion unit at its 200,000 b/d Milazzo refinery.

In Germany, Beta Raffineriegesellschaft Wilhelmshaven GmbH was expected to have the 160,000 b/d refinery at Wilhelmshaven fully on stream at yearend 1991.

The former owner, Mobil Oil Corp., had mothballed the plant for several years. Tentative plans are to add a hydrocracker.

### Western Hemisphere refinery construction plans

As befits the rapid privatization activity spreading across Latin America, that region also dominates refinery construction plans in the Western Hemisphere.

Petroleos del Peru plans to expand vacuum distillation capacity at its Iquitos, La Pampilla, and Talara refineries by a combined total of 57,000 b/d. Petroperu also is boosting FCC capacity at two of the plants and adding a 33,000 b/d visbreaker at La Pampilla. Empresa Colombiana de Petroleos has begun basic engineering work on a 75,000 b/d refinery planned for the Middle Magdalena Valley.

In Brazil, state owned Petroleos Brasileiro SA plans to add 113,000 b/d of crude capacity at its Canoas refinery and 143,000 b/d combined atmospheric and vacuum distillation capacity at is Mataripe refinery.

In Venezuela, Maraven SA plans to install a 60,000 b/d coker at its Cardon refinery.

Pemex is building a 50,000 b/d visbreaker at Cadereyta, Nuevo Leon, and Salina Cruz, a 40,000 b/d FCC unit at Salina Cruz, and a 30,000 b/d reformer at Tula.

In Canada, Husky Oil Operations Ltd. has a $1.3 billion Canadian project under way at its Lloydminster, Alta., refinery. Included are a 54,000 b/d heavy oil hydrocracker and a delayed coker expected to start up in September 1992.

It all reflects a global trend by refiners to stay abreast of product trends in a world that demands cleaner, less polluting products. That trend is certain to accelerate in the 1990s.

# Survey of operating refineries worldwide

(capacities of January 1, 1992)

| Country | No. plants | b/cd Crude | b/cd Catalytic cracking | b/cd Catalytic reforming |
|---|---|---|---|---|
| Abu Dhabi | 2 | 192,500 | .... | 30,100 |
| Algeria | 4 | 464,700 | .... | 55,600 |
| Angola | 1 | 32,100 | .... | 1,900 |
| Argentina | 12 | 696,285 | 171,300 | 41,300 |
| Australia | 10 | 703,000 | 201,300 | 166,900 |
| Austria | 1 | 210,000 | 25,100 | 33,700 |
| Bahrain | 1 | 243,000 | 39,000 | 18,000 |
| Bangladesh | 1 | 31,200 | .... | 1,650 |
| Barbados | 1 | 3,000 | .... | .... |
| Belgium | 4 | 602,000 | 108,900 | 95,800 |
| Bolivia | 3 | 45,250 | .... | 14,560 |
| Brazil | 13 | 1,406,220 | 317,085 | 23,610 |
| Brunei | 1 | 10,000 | .... | .... |
| Cameroon | 1 | 42,000 | .... | 7,000 |
| Canada | 28 | 1,905,050 | 402,670 | 371,100 |
| Chile | 3 | 142,700 | 34,500 | 9,200 |
| Colombia | 4 | 274,100 | 95,000 | 6,000 |
| Congo | 1 | 21,000 | .... | 2,000 |
| Costa Rica | 1 | 15,000 | .... | 1,200 |
| Cyprus | 1 | 18,600 | .... | 4,300 |
| Denmark | 3 | 185,500 | .... | 31,100 |
| Dominican Republic | 2 | 48,000 | .... | 9,100 |
| Ecuador | 5 | 141,800 | 16,000 | 2,780 |
| Egypt | 8 | 523,153 | .... | 33,540 |
| El Salvador | 1 | 16,300 | .... | 3,000 |
| Ethiopia | 1 | 18,000 | .... | 2,400 |
| Finland | 2 | 241,000 | 41,800 | 42,900 |
| France | 14 | 1,815,630 | 356,260 | 248,760 |
| Gabon | 1 | 24,000 | .... | 1,400 |
| Germany | 20 | 2,061,800 | 234,250 | 379,400 |
| Ghana | 1 | 26,600 | .... | 6,175 |
| Greece | 4 | 395,500 | 61,000 | 50,800 |
| Guatemala | 1 | 16,000 | .... | 3,000 |
| Honduras | 1 | 14,000 | .... | 1,800 |
| Hungary | 3 | 220,000 | 20,000 | 23,000 |
| India | 12 | 1,122,360 | 136,970 | 28,233 |
| Indonesia | 6 | 860,200 | 13,000 | 63,600 |
| Iran | 5 | 720,000 | .... | 105,400 |
| Iraq | 8 | 318,500 | .... | 43,500 |
| Ireland | 1 | 56,000 | .... | 11,000 |
| Israel | 2 | 208,000 | 24,000 | 28,000 |
| Italy | 19 | 2,386,358 | 314,300 | 299,850 |
| Ivory Coast | 2 | 69,000 | .... | 13,600 |
| Jamaica | 1 | 34,200 | .... | 3,240 |
| Japan | 41 | 4,612,450 | 646,025 | 632,500 |
| Jordan | 1 | 100,000 | 4,250 | 8,640 |
| Kenya | 1 | 90,000 | .... | 9,000 |
| Korea | 6 | 1,163,100 | .... | 130,000 |
| Kuwait | 4 | 819,000 | 42,000 | 33,000 |
| Lebanon | 2 | 37,500 | 7,250 | 7,442 |
| Liberia | 1 | 15,000 | .... | 2,000 |
| Libya | 3 | 348,400 | .... | 14,182 |
| Madagascar | 1 | 16,350 | .... | 2,600 |
| Malaysia | 4 | 209,500 | .... | 30,300 |
| Martinique | 1 | 12,000 | .... | 3,000 |
| Mexico | 8 | 1,574,000 | 243,000 | 187,800 |
| Morocco | 2 | 154,600 | 5,600 | 26,800 |
| Myanmar | 2 | 32,000 | .... | .... |
| Netherlands | 6 | 1,218,500 | 128,000 | 186,600 |
| Netherlands Antilles | 2 | 470,000 | 42,000 | 15,000 |
| New Zealand | 1 | 95,100 | .... | 26,600 |
| Nicaragua | 1 | 16,000 | .... | 3,000 |
| Nigeria | 4 | 433,250 | 82,700 | 70,070 |
| Norway | 3 | 288,000 | 41,000 | 47,600 |
| Oman | 1 | 80,000 | .... | 16,000 |
| Pakistan | 3 | 120,975 | .... | 4,800 |
| Panama | 1 | 40,000 | .... | 8,000 |
| Paraguay | 1 | 7,500 | .... | .... |
| Peru | 6 | 188,820 | 24,600 | 1,760 |
| Philippines | 4 | 287,100 | 26,400 | 37,200 |
| Poland | 9 | 333,000 | 32,000 | 35,000 |
| Portugal | 3 | 294,300 | 10,100 | 51,000 |
| Puerto Rico | 2 | 123,000 | 13,700 | 26,500 |
| Romania | 10 | 656,500 | 121,260 | 100,842 |
| Qatar | 1 | 60,000 | .... | 12,030 |
| Saudi Arabia | 8 | 1,862,500 | 87,541 | 183,922 |
| Senegal | 1 | 24,000 | .... | 2,600 |
| Sierra Leone | 1 | 10,000 | .... | .... |
| Singapore | 5 | 893,000 | .... | 63,600 |
| Somalia | 1 | 10,000 | .... | .... |
| South Africa | 4 | 430,500 | 84,400 | 62,600 |
| Spain | 10 | 1,321,000 | 157,300 | 195,600 |
| Sri Lanka | 1 | 50,000 | .... | 3,750 |
| Sudan | 1 | 21,700 | .... | 1,900 |
| Sweden | 5 | 434,500 | 28,500 | 75,500 |
| Switzerland | 2 | 132,000 | .... | 26,000 |
| Syria | 2 | 237,394 | .... | 31,352 |
| Taiwan | 2 | 542,500 | 45,200 | 56,500 |
| Tanzania | 1 | 17,000 | .... | 2,500 |
| Thailand | 3 | 220,550 | 26,100 | 27,550 |
| Trinidad | 2 | 246,000 | 26,000 | 27,900 |
| Tunisia | 1 | 34,000 | .... | 3,300 |
| Turkey | 5 | 703,580 | 41,644 | 63,083 |
| United Kingdom | 15 | 1,856,140 | 454,500 | 368,200 |
| United States | 192 | 15,326,556 | 5,504,300 | 3,938,570 |
| Uruguay | 1 | 28,500 | 4,750 | 2,850 |
| Venezuela | 6 | 1,171,000 | 220,700 | 8,900 |
| Virgin Islands | 1 | 545,000 | .... | 125,000 |
| Yemen | 2 | 114,500 | .... | 10,100 |
| Yugoslavia | 7 | 609,135 | 52,050 | 74,612 |
| Zaire | 1 | 17,000 | .... | 3,500 |
| Zambia | 1 | 23,750 | .... | 5,320 |
| **Total** | **632** | **59,357,356** | **10,815,305** | **9,413,543** |

*U.S. refineries,-like Conoco Inc.'s 159,500 b/cd plant at Lake Charles, La., face strong demand for gasoline, diesel fuel, and other high quality products. (Photo by K. Childress, courtesy Conoco).*

| WORLDWIDE REFINING | b/cd Crude capacity | b/cd Catalytic cracking | b/cd Cat reforming |
|---|---|---|---|
| **ABU DHABI** | | | |
| Abu Dhabi National Oil Co.–Ruwais | 120,000 | .... | [2]19,200 |
| Umm Al-Nar 2 | 72,500 | .... | [4]10,900 |
| **Total** | **192,500** | .... | **30,100** |
| **ALBANIA** | | | |
| Government-owned refineries at Ballsh, Cerrik, Stalin. | | | |
| **Total** | **40,000** | | |
| **ALGERIA** | | | |
| Sonatrach: Arzew | 60,000 | .... | 8,600 |
| Hassi Messaoud | 23,700 | .... | 2,000 |
| Maison Carree | 58,000 | .... | 15,000 |
| Skikda | 323,000 | .... | 30,000 |
| **Total** | **464,700** | .... | **55,600** |
| **ANGOLA** | | | |
| Fina Petroleos De Angola–Luanda | 32,100 | .... | [1]1,900 |
| **Total** | **32,100** | .... | **1,900** |
| **ARGENTINA** | | | |
| Destileria Argentina de Petróleo SA–Lomas de Zamora | 3,585 | .... | .... |
| Esso SAPA–Campana[1] | 93,000 | [1]29,600 | [2]8,300 |
| Galvan | 18,400 | .... | .... |
| Isaura SA–Bahia Blanca | 12,000 | .... | .... |
| Shell Cia. Argentina de Petróleo SA–Buenos Aires | 121,700 | [1]29,200 | [1]12,000 |
| Sol Petroleo SA—San Francisco Solana, Quilmes | 6,000 | .... | .... |
| Yacimientos Petroliferos Fiscales–Campo Duran | 32,000 | .... | .... |
| Dock Sud | 4,000 | .... | .... |
| La Plata | 216,000 | [1]71,900 | [1]9,000 |
| Lujan de Cuyo | 129,000 | [1]40,600 | [1]9,000 |
| Plaza Huincul | 23,000 | .... | [1]3,000 |
| San Lorenzo | 37,600 | .... | .... |
| **Total** | **696,285** | **171,300** | **41,300** |
| Solvent Extract: [1]3,600 b/cd | | | |
| **AUSTRALIA** | | | |
| Ampol Refineries Ltd.–Lytton | 74,000 | [1]28,000 | [4]19,000 |
| Australian Lubricating Oil Refinery Ltd.–Kurnell[1] | .... | .... | .... |
| BP Australia–Brisbane | 57,000 | [1]17,300 | [2]12,200 |
| Kwinana | 118,000 | [1]28,000 | [2]14,000 |
| Caltex Refining CPL–Kurnell | 105,000 | [1]44,000 | [2]27,000 |
| Mobil Oil Australia Ltd.–Adelaide | .... | .... | .... |
| Petroleum Refineries Australia PL–Adelaide | 65,500 | .... | [2]22,000 |
| Altona | 98,500 | [2]24,000 | [2]28,000 |
| Shell Refining (Australia) PL.–Clyde | 75,000 | [1]35,000 | [2]13,700 |
| Geelong | 110,000 | [1]25,000 | [2]11,000<br>[6]20,000 |
| **Total** | **703,000** | **201,300** | **166,900** |
| Solvent Extract: [1]6,500 b/cd | | | |
| **AUSTRIA** | | | |
| OeMV–Schwechat | 210,000 | [1]25,100<br>[6]7,045 | [2]15,600 |
| **Total** | **210,000** | **25,100** | **33,700** |
| **BAHRAIN** | | | |
| Bahrain Petroleum Co. BSC (Closed)–Sitra | 243,000 | [1]39,000 | [2]18,000 |
| **Total** | **243,000** | **39,000** | **18,000** |
| **BANGLADESH** | | | |
| Eastern Refinery Ltd.–Chittagong | **31,200** | .... | **[1]1,650** |
| **BARBADOS** | | | |
| Mobil Oil Barbados Ltd.–Bridgetown | **3,000** | .... | .... |

## BELGIUM

| WORLDWIDE REFINING | Crude capacity (b/cd) | Catalytic cracking (b/cd) | Cat reforming (b/cd) |
|---|---|---|---|
| Belgian Refining Corp. NV–Antwerp | 80,000 | .... | [3]11,600 |
| Esso Belgium–Antwerp | 239,000 | [1]32,400 | [4]39,200 |
| Nynas Petroleum NV—Antwerp | 15,000 | .... | .... |
| Fina Raffinaderij Antwerpen—Antwerp | 268,000 | [1]76,500 | [4]45,000 |
| **Total** | **602,000** | **108,900** | **95,800** |

## BOLIVIA

| WORLDWIDE REFINING | Crude capacity (b/cd) | Catalytic cracking (b/cd) | Cat reforming (b/cd) |
|---|---|---|---|
| Yacimientos Petroliferos Fiscales Bolivianos– | | | |
| Cochabamba | 27,250 | .... | [2]8,160 |
| Santa Cruz | 15,000 | .... | [2]6,400 |
| Sucre | 3,000 | .... | .... |
| **Total** | **45,250** | .... | **14,560** |

## BRAZIL

| WORLDWIDE REFINING | Crude capacity (b/cd) | Catalytic cracking (b/cd) | Cat reforming (b/cd) |
|---|---|---|---|
| Petróleo Brasileiro SA: Araucária, | | | |
| Paraná[1] | 144,800 | [1]42,300 | ... |
| Betim, Minas Gerais | 144,700 | [1]32,100 | .... |
| Canoas, Rio Grande do Sul | 72,400 | [1]13,700 | .... |
| Capuava, São Paulo | 30,200 | [2]17,300 | .... |
| Cubatão, São Paulo | 155,325 | [1]50,600 | [1]10,500 |
| Duque de Caxias, Rio de Janeiro[2] | 209,190 | [1]35,815 | [1]13,110 |
| Fortaleza, Ceará | .... | .... | .... |
| Manaus, Amazonas | 8,500 | [1]1,900 | .... |
| Mataripe, Bahia[3] | 113,525 | [1]25,000 | .... |
| Paulinia, São Paulo | 289,500 | [1]41,600 | .... |
| São José dos Campos, São Paulo | 215,080 | [1]53,770 | .... |
| Refinaria de Petróleo Ipiranga SA–Rio Grande do Sul | 13,000 | [1]3,000 | .... |
| Refinaria de Petroleos de Manguinhos SA–Rio de Janeiro | 10,000 | ....<br>[3]11,000 | .... |
| **Total** | **1,406,220** | **317,085** | **23,610** |

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[1] Solvent extraction: 27,800 b/cd. [2] 30,200 b/cd. [3] 3,400 b/cd.

## BRUNEI

| WORLDWIDE REFINING | Crude capacity (b/cd) | Catalytic cracking (b/cd) | Cat reforming (b/cd) |
|---|---|---|---|
| Brunei Shell Petroleum CL–Seria | **10,000** | .... | .... |

## BULGARIA

Government-owned refineries at Burgas, Pleven, Ruse.

| WORLDWIDE REFINING | Crude capacity (b/cd) | Catalytic cracking (b/cd) | Cat reforming (b/cd) |
|---|---|---|---|
| **Total** | **300,000** | | |

## CAMEROON

| WORLDWIDE REFINING | Crude capacity (b/cd) | Catalytic cracking (b/cd) | Cat reforming (b/cd) |
|---|---|---|---|
| Sonara–National Refining CL–Cape Limboh, Limbe | **42,000** | .... | **[2]7,000** |

## CANADA

| WORLDWIDE REFINING | Crude capacity (b/cd) | Catalytic cracking (b/cd) | Cat reforming (b/cd) |
|---|---|---|---|
| **Alberta** | | | |
| Canadian Turbo Inc.–Balzac | 27,500 | [1]11,570 | [2]7,550 |
| Husky Oil Operations Ltd.–Lloydminster | 23,500 | .... | .... |
| Imperial Oil Ltd.–Edmonton | 164,800 | [1]47,500 | [4]20,500 |
| Parkland Refining Ltd.–Bowden | 6,650 | .... | [2]3,000 |
| Petro-Canada Products Inc.–Edmonton | 115,500 | [1]33,300 | [2]9,000 |
| Shell Canada Ltd.–Scotford | 59,800 | .... | [6]21,500 |
| **Total** | **397,750** | **92,370** | **61,550** |
| **British Columbia** | | | |
| Chevron Canada Ltd.–North Burnaby | 45,000 | [1]13,000 | [2]10,000 |
| Husky Oil Operations Ltd.–Prince George | 9,500 | [1]3,300 | [2]1,400 |
| Imperial Oil Ltd.–Ioco | 44,200 | [1]13,100 | [4]6,700 |
| Petro-Canada Products Inc.– | | | |
| Port Moody | 25,500 | .... | [3]8,600 |
| Taylor | 15,500 | [1]6,300 | [2]3,000 |
| Shell Canada Ltd.–Shellburn, Burnaby | 24,000 | [1]6,100 | [2]3,600 |
| **Total** | **163,700** | **41,800** | **33,300** |
| **New Brunswick** | | | |
| Irving Oil Ltd.–St. John | 237,500 | [1]17,100 | [2]34,650 |
| **Total** | **237,500** | **17,100** | **34,650** |
| **Newfoundland** | | | |
| Newfoundland Processing Ltd.–Come By Chance | **105,000** | .... | **[2]26,000** |
| **Northwest Territories** | | | |
| Imperial Oil Ltd.–Norman Wells | **3,500** | .... | .... |
| **Nova Scotia** | | | |
| Imperial Oil Ltd.–Dartmouth | 84,400 | [1]24,700 | [4]10,000 |
| Ultramar Canada Inc.–Halifax | 20,000 | [1]7,200 | [2]3,600 |
| **Total** | **104,400** | **31,900** | **13,600** |
| **Ontario** | | | |
| Imperial Oil Ltd.–Nanticoke | 112,100 | [1]40,900 | [6]26,800 |
| Sarnia | 118,800 | [1]25,700 | [2]13,000<br>[4]14,000 |
| Petro-Canada Products Inc.– | | | |
| Clarkson | 41,500 | .... | [6]9,800 |
| Oakville | 80,500 | [1]25,400 | [2]13,200 |
| Shell Canada Ltd.–Sarnia | 71,000 | [1]14,400 | [2]21,000 |
| Sunoco Inc.–Sarnia | 83,400 | [2]16,300 | [2]26,100 |
| **Total** | **507,300** | **122,700** | **123,900** |
| **Quebec** | | | |
| Petro-Canada Products Inc.–Montreal | 87,400 | [1]17,200 | [2]31,300 |
| Shell Canada Ltd.–Montreal | 120,000 | [1]22,000 | [2]20,700 |
| Ultramar Canada Inc.–St. Romuald | 120,000 | [1]40,000 | [2]17,100 |
| **Total** | **327,400** | **79,200** | **69,100** |
| **Saskatchewan** | | | |
| Consumers' Cooperative Refineries Ltd.–Regina | 45,200 | [1]17,600 | [2]9,000 |
| Producers Pipeline–Moose Jaw | 13,300 | .... | .... |
| **Total** | **58,500** | **17,600** | **9,000** |
| **Total Canada** | **1,905,050** | **402,670** | **371,100** |

## CHILE

| WORLDWIDE REFINING | Crude capacity (b/cd) | Catalytic cracking (b/cd) | Cat reforming (b/cd) |
|---|---|---|---|
| ENAP–Gregorio-Magallanes | 9,000 | .... | .... |
| Petrox SA–Talcahuano | 71,000 | [1]17,000 | [2]4,200 |
| Refineria de Concón–Concón | 62,700 | [1]17,500 | [1]5,000 |
| **Total** | **142,700** | **34,500** | **9,200** |

## CHINA

Government-owned refineries at Anshan, Beijing, Dalian, Daqing, Fushun, Hangzhou, Jinxi, Karamai-Dushanzi, Lanchow, Lenghu, Maoming, Nanchong, Nanjing, Shanghai, Shengli, Tianjin, Yumen.

| WORLDWIDE REFINING | Crude capacity (b/cd) | Catalytic cracking (b/cd) | Cat reforming (b/cd) |
|---|---|---|---|
| **Total** | **2,200,000** | | |

## COLOMBIA

| WORLDWIDE REFINING | Crude capacity (b/cd) | Catalytic cracking (b/cd) | Cat reforming (b/cd) |
|---|---|---|---|
| Empresa Colombiana de Petróleos–Barrancabermeja-Santander[1] | 196,000 | [1]66,000 | [2]6,000 |
| Cartagena, Bolivar | 70,700 | [1]29,000 | .... |
| Orito, Putumayo | 2,400 | .... | .... |
| Tibu, N. de Santander | 5,000 | .... | .... |
| **Total** | **274,100** | **95,000** | **6,000** |

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Solvent extraction: [1]37,000 b/cd.

## CONGO

| WORLDWIDE REFINING | Crude capacity (b/cd) | Catalytic cracking (b/cd) | Cat reforming (b/cd) |
|---|---|---|---|
| Coraf–Pointe-Noire | **21,000** | .... | **[2]2,000** |

## COSTA RICA

| WORLDWIDE REFINING | Crude capacity (b/cd) | Catalytic cracking (b/cd) | Cat reforming (b/cd) |
|---|---|---|---|
| Refinadora Costarricense de Petroleo SA–Limón | **15,000** | .... | **[2]1,200** |

## CUBA

Government-owned refineries at Cabaiguan, Cienfuegos, Havana, Santiago de Cuba.

| WORLDWIDE REFINING | Crude capacity (b/cd) | Catalytic cracking (b/cd) | Cat reforming (b/cd) |
|---|---|---|---|
| **Total** | **200,000** | | |

| WORLDWIDE REFINING | b/cd | | |
|---|---|---|---|
| | Crude capacity | Catalytic cracking | Cat reforming |
| **CYPRUS** | | | |
| Cyprus Petroleum Refinery Ltd.–Larnaca | **18,500** | .... | **[2]4,300** |
| **CZECHOSLOVAKIA** | | | |
| Government owned refineries at Pardubice, Strazke, Zaluzi, Zyolen. Crude Capacity | | | 237,250 |
| Kaucuk s.p.–Kralupy | 65,000 | .... | [2]8,000 |
| Koramo Kolin—Kolin[2] | 4,750 | .... | .... |
| Slovnaft s.p.–Bratislava[1] | 148,000 | .... | [2]22,500 |
| **Total** | **455,000** | .... | **30,500** |
| Solvent extraction: [1]1,000 b/cd, [2]1,550 b/cd. | | | |
| **DENMARK** | | | |
| AS Dansk Shell–Fredericia | 62,000 | .... | [2]12,000 |
| Statoil AS–Kalundborg | 65,000 | .... | [2]8,600 |
| Kuwait Petroleum Refining (Danmark) A/S–Skaelskoer | 58,500 | .... | [2]10,500 |
| **Total** | **185,500** | **31,100** | .... |
| **DOMINICAN REPUBLIC** | | | |
| Falconbridge Dominicana C por A–La Bonao | 16,000 | .... | .... |
| Refineria Dominicana de Petróleo SA–Haina | 32,000 | .... | [1]9,100 |
| **Total** | **48,000** | .... | **9,100** |
| **ECUADOR** | | | |
| CEPE–Esmeraldas | 90,000 | [1]16,000 | [1]2,780 |
| Sta. Elena Peninsula | 32,300 | .... | .... |
| Refieria Amazonas | 10,000 | .... | .... |
| Repetrol–Santa Elena | 8,500 | .... | .... |
| Texaco–Lago-Agrio | 1,000 | .... | .... |
| **Total** | **141,800** | **16,000** | **2,780** |
| **EGYPT** | | | |
| Alexandria Petroleum Co.–Alexandria–(El-Mex) | 97,850 | .... | .... |
| Cairo Oil Refining Co.–Mostorod | 156,750 | .... | [2]9,000 |
| Tanta | 21,800 | .... | .... |
| Amerya Oil Refining Co.–Alexandria | 64,000 | .... | [2]12,000 |
| El-Nasr Petroleum Co.–El-Suez | 58,400 | .... | .... |
| Wadi-Feran | 9,680 | .... | .... |
| Suez Oil Processing Co.–El-Suez | 62,530 | .... | [2]12,540 |
| Assiout | 52,143 | .... | .... |
| **Total** | **523,153** | .... | **33,540** |
| **El SALVADOR** | | | |
| Refineria Petrólera Acajutla SA–Acajutla | 16,300 | .... | [1]3,000 |
| **Total** | **16,300** | .... | **3,000** |
| **ETHIOPIA** | | | |
| Ethiopian Petroleum Corp.–Assab | **18,000** | .... | **[3]2,400** |
| **FINLAND** | | | |
| Neste Oy–Naantali | 44,000 | [2]13,300 | [5]6,800 |
| Porvoo | 197,000 | [1]28,500 | [5]36,100 |
| **Total** | **241,000** | **41,800** | **42,900** |
| **FRANCE** | | | |
| CRD—Total France–Gonfreville L'Orcher[1] | 309,000 | [1]31,500 | [2]45,400 |
| La Mède | 136,000 | [1]29,700 | [4]23,400 |
| Mardyck | 122,000 | [1]29,800 | [4]20,500 |
| Cie. Rhénane de Raffinage–Reichstett-Vendenheim | 80,000 | [1]13,760 | [1]12,900 |
| Elf France–Donges | 200,000 | [1]66,000 | [2]25,600 |
| Feyzin | 120,000 | [1]22,700 | [2]8,600 |
| Grandpuits | 92,000 | [1]28,800 | [2]12,900 |

| WORLDWIDE REFINING | b/cd | | |
|---|---|---|---|
| | Crude capacity | Catalytic cracking | Cat reforming |
| Esso SAF–Fos sur Mer | 100,000 | [1]24,000 | [1]18,000 |
| Port Jerome | 136,000 | [1]24,000 | [1]16,000 |
| Mobil Oil Francaise–Notre Dame de Gravenchon | 57,000 | .... | [2]13,300 |
| Shell Francaise–Berre l'Etang | 128,000 | [1]38,000 | [2]19,000 |
| Petit Couronne | 158,000 | [1]20,000 | [2]28,000 |
| Ste. Francaise des Petroles BP–Dunkirk | .... | .... | .... |
| Lavera | 177,630 | [1]28,000 | [1]5,160 |
| **Total** | **1,815,630** | **356,260** | **248,760** |
| Solvent extraction: [1]9,800 b/cd. | | | |
| **GABON** | | | |
| Ste. Gabonaise de Raffinage–Port Gentil | **24,000** | .... | **[3]1,400** |
| **GERMANY** | | | |
| Addinol Mineralol GmbH Lutzkendorf—Krumpa, Kreis Merseburg[1] | 16,500 | .... | .... |
| BP Oiltech Gmbh—Hamburg[2] | .... | .... | .... |
| DEA Mineraloel AG–Heide | 80,000 | [1]9,000 | [4]20,000 |
| UK-Wesseling | 100,000 | .... | [4]19,000 |
| Deutsche Shell AG–Godorf | 170,000 | .... | [2]17,000 |
| Harburg-Grasbrook | 86,000 | [3]7,000<br>[1]15,000 | [6]16,000 |
| Erdoel Raffinerie Neustadt GmbH–Neustadt-Donau | 144,000 | [1]26,000 | [1]17,700 |
| Esso AG–Ingolstadt | 95,000 | [1]24,500 | [2]15,600 |
| Karlsruhe | 150,000 | .... | [2]30,900 |
| Holborn Europa Raffinerie GmbH—Harburg | 78,000 | [1]18,750 | [2]14,700 |
| Hydrierwerk Zeitz GmbH–Zeitz | 73,700 | .... | .... |
| Leune-Werke AG–Leuna | 100,000 | .... | [2]15,000 |
| Mobil Oil AG–Woerth | 93,000 | [1]19,000 | [2]15,900 |
| OMV Deutschland GmbH–Burghausen | 68,400 | .... | .... |
| PCK Schwedt AG–Schwedt | 230,000 | [1]37,000 | [2]23,000<br>[6]18,000 |
| Raffineriegesellschaft–Vohburg/Ingolstadt | 120,000 | [1]19,000 | [2]18,000<br>[6]18,800 |
| Ruhr Oel GmbH–Gelsenkirchen | 215,400 | .... | [1]11,900<br>[5]27,000 |
| Wintershall AG–Lingen | 65,000 | .... | [2]12,200<br>[4]15,000 |
| Salzbergen | 2,800 | .... | .... |
| **Total** | **2,061,800** | **234,250** | **379,400** |
| Solvent extraction: [1]5,000 b/cd. [2]8,400 b/cd. | | | |
| Note: Some of the smaller east german refineries are not accounted for. | | | |
| **GHANA** | | | |
| Ghanaian Italian Petroleum CL–Tema | **26,800** | .... | **[2]8,175** |
| **GREECE** | | | |
| Hellenic Aspropyrgos Refinery SA–Aspropyrgos | 121,000 | [1]32,200 | [2]9,800<br>[6]20,600 |
| Motor Oil (Hellas) Corinth Refineries SA–Aghii Theodori | 100,000 | [1]28,800 | [2]12,300 |
| Petrola Hellas SA–Elefsis | 108,000 | .... | .... |
| Thessaloniki Refining Co. AE–Thessaloniki | 66,500 | .... | [2]8,100 |
| **Total** | **395,500** | **61,000** | **50,800** |
| **GUATEMALA** | | | |
| Texas Petroleum Co.–Escuintla | 16,000 | .... | [2]3,000 |
| **Total** | **16,000** | .... | **3,000** |
| **HONDURAS** | | | |
| Refineria Texas de Honduras SA–Puerto Cortes | 14,000 | .... | [1]1,800 |
| **Total** | **14,000** | .... | **1,800** |
| **HUNGARY** | | | |
| Dunai KV–Százhalombatta | 150,000 | [1]20,000 | [2]23,000 |

| WORLDWIDE REFINING | b/cd | | |
|---|---|---|---|
| | Crude capacity | Catalytic cracking | Cat reforming |
| Tiszai KV–Leninváros | 60,000 | .... | .... |
| Zalai KV–Zalaegerszeg | 10,000 | .... | .... |
| **Total** | **220,000** | **20,000** | **23,000** |

## INDIA

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Bharat Petroleum CL–Mahul, Bombay | 156,600 | [1]33,800 | [1]5,400 |
| Bongaigaon Refinery & Petrochemicals Ltd.–Bongaigaon, Assam | 27,610 | .... | [2]1,833 |
| Cochin Refineries Ltd.–Ambalamugal | 90,000 | [1]20,000 | [1]5,000 |
| Hindustan Petroleum CL–Mahul, Bombay[1] | 111,650 | [1]12,000 | .... |
| Visakhapatnam | 90,000 | [1]19,200 | .... |
| Indian Oil CL–Barauni, Bihar[2] | 70,200 | .... | .... |
| Digboi, Assam | 11,700 | .... | .... |
| Guwahati, Assam | 18,100 | .... | .... |
| Koyali, Gujarat | 205,700 | [1]20,100 | [2]8,300 |
| Haldia, West Bengal[3] | 61,100 | .... | [1]5,300 |
| Mathura, Uttar Pradesh | 165,000 | [1]20,100 | .... |
| Madras Refineries Ltd.–Madras | 114,700 | [1]11,770 | [1]2,400 |
| **Total** | **1,122,360** | **136,970** | **28,233** |

Solvent extraction: [1]10,000 b/cd. [2]4,000 b/cd. [3]16,000 b/cd.

## INDONESIA

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Pertamina–Balikpapan, Kalimantan | 257,500 | .... | [6]20,000 |
| Cilacap, Central Java | 302,400 | .... | [1]12,800<br>[6]17,300 |
| Dumai, Central Sumatra | 122,500 | .... | [1]5,400<br>[6]8,100 |
| Musi, South Sumatra | 126,900 | [1]13,000 | .... |
| Pangakalan Brandan, North Sumatra | 4,800 | .... | .... |
| Sungai Pakning, Central Sumatra | 46,100 | .... | .... |
| **Total** | **860,200** | **13,000** | **63,600** |

## IRAN

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| National Iranian Oil Co.–Abadan | 190,000 | .... | [6]41,555 |
| Esfahan | 200,000 | .... | [6]29,600 |
| Shiraz | 40,000 | .... | [5]6,245 |
| Tabriz | 80,000 | .... | .... |
| Tehran | 210,000 | .... | [6]28,000 |
| **Total** | **720,000** | **....** | **105,400** |

## IRAQ

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Oil Refineries Administration–Baiji | 150,000 | .... | 22,000<br>16,500 |
| Basra | 70,000 | .... | .... |
| Daura | 71,000 | .... | 5,000 |
| K3-Haditha | 7,000 | .... | .... |
| Khanaqin | 12,000 | .... | .... |
| Mufthia | 4,500 | .... | .... |
| Qaiyarah, Mosul | 2,000 | .... | .... |
| Iraqi Company for Oil Operations–Kirkuk | 2,000 | .... | .... |
| **Total** | **318,500** | **....** | **43,500** |

Note: Present status uncertain due to lack of information.

## IRELAND

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Irish National Refining plc–Whitegate | **56,000** | .... | **[4]11,000** |

## ISRAEL

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Oil Refineries Ltd.–Ashdod | 88,000 | .... | [2]12,000 |
| Haifa | 120,000 | [1]24,000 | [2]16,000 |
| **Total** | **208,000** | **24,000** | **28,000** |

## ITALY

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Agip Plas SpA–Livorno | 84,000 | .... | [6]12,000 |
| Agip Raffinazione SpA–Porto Marghera | 80,000 | .... | [6]15,000 |
| Rho, Milan | 80,000 | [1]14,300 | [2]11,000 |
| Sannazzaro, Pavia | 200,000 | [1]34,000 | [2]12,000<br>[6]16,700 |
| Taranto | 84,000 | ....<br>[3]37,250 | [2]17,000 |
| Anonima Petroli Italiana–Falconara, Marittima | 63,000 | .... | [2]11,000 |
| Arcola Petrolifera SpA–La Spezia | 17,358 | .... | .... |
| Esso Italiana SpA–Augusta, Siracusa | 180,000 | [1]44,000 | [2]22,000 |
| Industrie Chimiche Italiane de Petrolio SpA-Frassino, Mantova | 55,000 | .... | [2]7,200 |
| Iplom SpA–Busalla | 46,500 | .... | .... |
| Isab–Priolo Gargallo | 220,000 | .... | [4]34,500 |
| Kuwait Raffinazione E Chimica–Naples | 100,000 | [2]20,000 | [2]26,000 |
| Raffineria di Roma SpA–Rome | 81,500 | .... | [2]14,200 |
| Raffineria Mediterranea Spa–Milazzo | 160,000 | [1]45,000 | [2]12,000 |
| Saras SpA–Sarroch | 285,000 | [1]72,000 | [5]27,000 |
| Sarpom–S. Martino Di Trecate | 210,000 | [1]18,000 | [1]19,000<br>[4]8,000 |
| Praoil–Gela | 105,000 | [1]35,000 | [2]13,850 |
| Priolo | 240,000 | [1]32,000 | [2]9,000 |
| Tamoil Italia SpA–Cremona | 95,000 | .... | [2]12,400 |
| **Total** | **2,386,358** | **314,300** | **299,850** |

## IVORY COAST

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Ste. Ivoirienne de Raffinage–Abidjan | 59,000 | .... | [2]13,600 |
| Ste. Multinationale de Bitumes—Abidjan | 10,000 | .... | .... |
| **Total** | **69,000** | **....** | **13,600** |

## JAMAICA

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Petrojam Ltd.–Kingston | 34,200 | .... | [1]3,240 |
| **Total** | **34,200** | **....** | **3,240** |

## JAPAN

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Cosmo Oil CL–Chiba | 209,000 | [1]30,400 | [2]34,675 |
| Sakaide | 133,000 | [1]16,150 | [2]13,300 |
| Sakai | 104,500 | [1]18,525 | [2]6,650 |
| Yokkaichi City | 166,250 | [1]23,750 | [2]5,700<br>[4]10,450 |
| Fuji Oil CL–Sodegaura,Chiba | 146,500 | [1]14,000 | [2]16,300 |
| General Sekiyu Seisei KK–Sakai | 140,000 | [1]32,500 | [2]30,600 |
| Idemitsu Kosan CL–Chita, Aichi | 150,000 | [1]33,000 | [3]18,000 |
| Himeji, Hyogo | 120,000 | .... | [1]17,000 |
| Ichihara, Chiba[2] | 274,000 | [1]42,000 | [1]17,000 |
| Tokuyama, Yamaguchi | 120,000 | [1]24,000 | .... |
| Tomakomai, Hokkaido | 114,000 | .... | [1]18,000 |
| Kainan Petroleum Refining CL–Kaiwan City, Wakayama | 64,000 | .... | .... |
| Kashima Oil CL–Kashima, Ibaragi | 165,000 | [1]20,000 | [2]7,500<br>[5]14,000 |
| Koa Oil CL–Marifu | 110,000 | [1]20,000 | [3]20,000 |
| Osaka | 80,000 | [1]23,500 | [2]11,000 |
| Kyenus Sekiyu Seisei KK–Kawasaki | 66,500 | .... | .... |
| Kyokuto Petroleum Ltd.–Chiba | 125,000 | .... | [2]22,000 |
| Kyushu Oil CL–Oita | 130,000 | [1]16,500 | [2]8,000 |
| Mitsubishi Oil CL–Kawasaki | 55,000 | .... | [2]10,000 |
| Mizushima | 220,000 | [1]34,000 | [2]25,000<br>[6]18,500 |
| Nansei Sekiyu KK–Nishihara, Okinawa | 72,000 | .... | [2]8,600 |
| Nihonkai Oil CL–Toyama | 46,000 | [2]5,000 | .... |
| Nippon Mining CL–Chita | 76,800 | [1]13,600 | [6]19,900 |
| Funakawa | 5,400 | .... | .... |
| Mizushima[1] | 172,000 | [1]36,200 | [4]20,800 |
| Nippon Oil CL–Niigata | 26,000 | [2]5,000 | .... |
| Nippon Petroleum Refining CL–Muroran | 150,000 | [1]21,000 | .... |
| Nakagusuku, Okinawa | .... | .... | [2]3,000 |
| Negishi | 305,000 | [1]39,000 | [2]20,000 |
| Yokohama | .... | .... | [2]4,000 |
| Okinawa Sekiyu Seisei–Yonashiro, Okinawa | 57,000 | .... | .... |
| Seibu Oil CL–Yamaguchi | 110,100 | [1]19,900 | [2]20,000 |
| Showa Shell Sekiyu KK–Kawasaki | 96,400 | .... | [2]13,800 |
| Niigata | 27,500 | .... | [2]4,300 |
| Showa Yokkaichi Sekiyu CL–Yokkaichi | 165,200 | [1]22,600 | [2]40,600 |
| Taiyo Oil CL–Ehime | 65,000 | .... | [1]6,000<br>[3]23,000 |

| WORLDWIDE REFINING | b/cd | | |
|---|---|---|---|
| | Crude capacity | Catalytic cracking | Cat reforming |
| Tonen Corp.–Kawasaki | 209,000 | [1]74,100 | [2]18,600 |
| Wakayama | 157,700 | [1]34,200 | [2]34,875 |
| Toa Oil CL–Kawasaki | 59,700 | [1]27,100 | [2]7,100 |
| Toho Oil CL–Owase | 35,000 | .... | .... |
| Tohoku Oil CL–Sendai | 83,900 | .... | [2]12,000 |
| **Total** | **4,612,450** | **646,025** | **632,570** |
| Solvent extraction: [1]3,900 b/cd. [2]16,000 b/cd. | | | |
| **JORDAN** | | | |
| Jordan Petroleum Refinery–Zerka | 100,000 | [1]4,250 | [2]8,640 |
| **Total** | **100,000** | **4,250** | **8,640** |
| **KENYA** | | | |
| Kenya Petroleum Refineries Ltd.–Mombasa | 90,000 | .... | [1]3,800<br>[2]5,200 |
| **Total** | **90,000** | .... | **9,000** |
| **KOREA, N.** | | | |
| Government-owned, Unggi | **42,000** | | |
| **KOREA, S.** | | | |
| Honam Oil Refinery CL–Yocheon | 342,000 | .... | [2]15,300 |
| Kukdong Oil CL–Busan[1] | 10,000 | .... | .... |
| Daesan | 60,000 | .... | [2]3,000 |
| Kyung In Energy CL–Inchon | 60,000 | .... | [2]3,600 |
| Ssangyong Oil Refining CL–Onsan[2] | 146,100 | .... | [2]4,800<br>[6]27,000 |
| Yukong Ltd.–Ulsan | 545,000 | .... | [2]21,300<br>[4]55,000 |
| **Total** | **1,163,100** | .... | **130,000** |
| Solvent extraction: [1]2,100 b/d. [2]8,000 b/d. | | | |
| **KUWAIT** | | | |
| Getty Oil Co. (subsidiary of Texaco Inc.)–Mina Al-Zour | 72,000 | .... | .... |
| Kuwait National Petroleum Co. –Mina Abdulla | 190,000 | .... | .... |
| Mina Al-Ahmadi | 370,000 | [1]28,000 | [2]33,000 |
| Shuaiba | 187,000 | [2]14,000 | .... |
| **Total** | **819,000** | **42,000** | **33,000** |
| Note: Most capacity shutdown due to damage during Iraqi occupation. | | | |
| **LEBANON** | | | |
| Tripoli Oil Installations–Tripoli | 20,000 | [1]7,250 | [2]4,392 |
| Zahrani Oil Installations–Sidon | 17,500 | .... | [1]3,050 |
| **Total** | **37,500** | **7,250** | **7,442** |
| **LIBERIA** | | | |
| Liberia Petroleum Refining–Monrovia | 15,000 | .... | [1]2,000 |
| **Total** | **15,000** | .... | **2,000** |
| **LIBYA** | | | |
| Azzawiya Oil Refining Co.–Azzawiya | 120,000 | .... | [2]12,982 |
| Ras Lanuf Oil & Gas Processing Co.–Ras Lanuf | 220,000 | .... | .... |
| Sirte Oil Co.–Brega | 8,400 | .... | [1]1,200 |
| **Total** | **348,400** | .... | **14,182** |
| **MADAGASCAR** | | | |
| Solima–Managareza, Tamatave | **16,350** | .... | [1]**2,600** |
| **MALAYSIA** | | | |
| Esso Malaysia Berhad–Port Dickson | 47,500 | .... | [2]13,300 |
| Petronas Penapisan Sdn. Berhad –Kerteh, Kemaman, Terengganu | 27,000 | .... | .... |
| Sarawak Shell Berhad–Luton | 45,000 | .... | .... |
| Shell Refining Co. Berhad–Port Dickson | 90,000 | .... | [1]4,000<br>[4]13,000 |
| **Total** | **209,500** | .... | **30,300** |
| **MARTINIQUE** | | | |
| Ste. Anonyme de la Raffinerie des Antilles–Fort-de-France | 12,000 | .... | [2]3,000 |
| **Total** | **12,000** | .... | **3,000** |
| **MEXICO** | | | |
| Petroleos Mexicanos—Cadereyta | 235,000 | [1]40,000 | [2]20,000 |
| Ciudad Madero[1] | 195,000 | [1]43,000<br>[4]9,000 | [2]15,000 |
| Minatitlan | 200,000 | [1]24,000<br>[2]16,000 | [2]48,000 |
| Poza Rica | 50,000 | .... | .... |
| Reynosa | 9,000 | .... | .... |
| Salamanca | 235,000 | [1]40,000 | [2]24,800 |
| Salina Cruz | 330,000 | [1]40,000 | [6]50,000 |
| Tula, Hidalgo | 320,000 | [1]40,000 | [2]30,000 |
| **Total** | **1,574,000** | **243,000** | **187,800** |
| Solvent extraction: [1]38,000 b/cd. | | | |
| **MOROCCO** | | | |
| Samir–Mohammedia | 129,000 | .... | [2]24,000 |
| Ste. Cherifienne des Petroles –Sidi Kacem | 25,600 | [2]5,600 | [1]2,800 |
| **Total** | **154,600** | **5,600** | **26,800** |
| **MYANMAR** | | | |
| Myanma Petrochemical Enterprise–Chauk | 6,000 | .... | .... |
| Thanlyin | 26,000 | .... | .... |
| **Total** | **32,000** | .... | .... |
| Formerly Burma | | | |
| **NETHERLANDS** | | | |
| Esso Nederland BV–Rotterdam | 175,000 | .... | [5]26,600 |
| Kuwait Petroleum Europoort BV–Rotterdam[1] | 75,500 | .... | [4]21,000 |
| Netherlands Refining Co.–Europoort & Pernis | 460,000 | [1]50,000 | [2]58,000 |
| Shell Nederland Raffinaderij BV–Pernis | 348,000 | [1]78,000 | [2]17,000<br>[6]42,000 |
| Smid & Hollander Raffinaderij BV–Amsterdam | 10,000 | .... | .... |
| Total Raffinaderij Nederland NV–Vlissingen | 150,000 | .... | [3]22,000 |
| **Total** | **1,218,500** | **128,000** | **186,600** |
| Solvent extraction: [1]3,200 b/cd. | | | |
| **NETHERLANDS ANTILLES** | | | |
| Refineria Isla Curazao SA–Emmastad | 320,000 | [1]42,000 | [2]15,000 |
| Coastal Aruba Refining Co. N.V.–San Nicolas | 150,000 | .... | .... |
| **Total** | **470,000** | **42,000** | **15,000** |
| **NEW ZEALAND** | | | |
| New Zealand Refining–Whangarei[1] | 95,100 | .... | [2]26,600 |
| **Total** | **95,100** | .... | **26,600** |
| Solvent extraction: [1]10,000 b/cd. | | | |
| **NICARAGUA** | | | |
| Esso Standard Oil SA Ltd.–Managua | 16,000 | .... | [1]3,000 |
| **Total** | **16,000** | .... | **3,000** |

|  |  | b/cd |  |
|---|---|---|---|
| **WORLDWIDE REFINING** | **Crude capacity** | **Catalytic cracking** | **Cat reforming** |

## NIGERIA

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Kaduna Refinery & Petrochemical Co. (NNPC)–Kaduna[1] | 104,500 | [1]18,000 | [2]15 300 |
| Port Harcourt Refining Co. (NNPC)–Alesa Eleme | 60,000 | .... | [1]6,000 |
| Rivers State | 150,000 | [1]40,000 | [6]33,000 |
| Warri Refinery & Petrochemical Co. (NNPC)–Warri | 118,750 | [1]24,700 | [2]15,770 |
| **Total** | **433,250** | **82,700** | **70,070** |

Solvent extraction: [1]9,492 b/cd.
†Dimersol

## NORWAY

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Esso Norge AS–Slagen-Toensberg | 90,000 | .... | [2]10,600 |
| Norske Shell AS–Sola | 53,000 | .... | [2]11,000 |
| Statoil Division Mongstad–Mongstad | 145,000 | [2]41,000 | [2]10,000<br>[5]16,000 |
| **Total** | **288,000** | **41,000** | **47,600** |

## OMAN

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Oman Refinery Co.–Mina Al Fahal | **80,000** | .... | **[2]16,000** |

## PAKISTAN

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Attock Refinery Ltd.–Rawalpindi | 30,500 | .... | .... |
| National Refinery Ltd.–Korangi, Karachi[1] | 44,175 | .... | [2]2,100 |
| Pakistan Refinery Ltd.–Karachi | 46,300 | .... | [4]2,700 |
| **Total** | **120,975** | .... | **4,800** |

[1]Solvent Extraction: 5,605

## PANAMA

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Refineria Panama SA–Las Minas | 40,000 | .... | [2]8,000 |
| **Total** | **40,000** | .... | **8,000** |

## PARAGUAY

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Petroleos Paraguayos–Villa Elisa | **7,500** | .... | .... |

## PERU

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Petróleos del Peru: |  |  |  |
| Conchan | 6,300 | .... | .... |
| Iquitos, Loreto | 10,500 | .... | .... |
| La Pampilla, Lima | 105,000 | [1]8,000 | [1]1,760 |
| Marsella, Loreto | 2,170 | .... | .... |
| Pucallpa | 2,850 | .... | .... |
| Talara | 62,000 | [1]16,600 | .... |
| **Total** | **188,820** | **24,600** | **1,760** |

## PHILIPPINES

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Caltex (Philippines) Inc.–Batangas | 66,300 | [1]11,400 | [2]5,400 |
| Petron Corp.–Limay, Bataan | 155,000 | [2]15,000 | [1]6,800<br>[2]17,000 |
| Philippine Petroleum Corp.–Pililla | .... | .... | .... |
| Pilipinas Shell Petroleum–Tabangao | 65,800 | .... | [1]8,000 |
| **Total** | **287,100** | **26,400** | **37,200** |

†* Polymerization Mothballed.

## POLAND

Government-owned refineries at Czechowice, Glinik Mariampolski, Jasto, Jealicze, Kralaty, L. Warynski, Trzebinia.

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Crude capacity | 73,000 |  |  |
| Mazovian Refinery & Petrochemical Works–Plock | 200,000 | [1]32,000 | [2]24,000 |
| Petroleum Refinery Gdansk–Gdansk[1] | 60,000 | .... | [4]11,000 |
| **Total** | **333,000** | **32,000** | **35,000** |

Solvent extraction: [1]6,800 b/cd.

|  |  | b/cd |  |
|---|---|---|---|
| **WORLDWIDE REFINING** | **Crude capacity** | **Catalytic cracking** | **Cat reforming** |

## PORTUGAL

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Petrogal–Lisboa | .... | [2]10,100 | .... |
| Leça da Palmeira, Porto | 88,300 | .... | [2]15,600<br>[4]10,500 |
| Sines | 206,000 | .... | [6]24,900 |
| **Total** | **294,300** | **10,100** | **51,000** |

## PUERTO RICO

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Caribbean Petroleum Corp.–Bayamón | 38,000 | [1]13,700 | [2]6,500 |
| Puerto Rico Sun Oil Co.–Yabucoa | 85,000 | .... | [2]20,000 |
| **Total** | **123,000** | **13,700** | **26,500** |

## QATAR

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| National Oil Distribution Co.–Umm Said | 60,000 | [2]2,200<br>[6]9,830 | .... |
| **Total** | **60,000** | .... | **12,030** |

## ROMANIA

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Arpechim SA—Pitesti | 125,000 | [1]36,760 | [1]20,422 |
| Astra SA—Pitesti | 38,000 | .... | .... |
| Darmanesti Refinery Darmanesti | 33,500 | .... | .... |
| Petrobrazi SA—Ploiesti | 150,000 | [1]21,800 | [1]34,460 |
| Petrolsub SA—Barcau | 8,000 | .... | .... |
| Petromidia SA—Midia | 70,000 | [1]20,000 | [2]11,490 |
| Petrotel SA—Ploiesti | 104,000 | [1]20,900 | [2]11,490 |
| Rafo SA—Onesti | 104,000 | [2]21,800 | [1]22,980 |
| Steaua SA—Cimpina | 8,000 | .... | .... |
| Vega SA—Ploiesti | 16,000 | .... | .... |
| **Total** | **656,500** | **121,260** | **100,842** |

## SAUDI ARABIA

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Saudi Arabian Oil Co. (Saudi Aramco)–Ras Tanura | 530,000 | .... | [2]50,000 |
| Arabian Oil CL–Ras Al Khafji | 30,000 | .... | .... |
| Jeddah Oil Refinery–Jeddah | 82,000 | [1]9,041 | [2]2,622 |
| Petromin-Mobil–Yanbu | 300,000 | [1]78,500 | [5]43,300 |
| Petromin Petrola Rabigh Refinery Co.—Rabigh | 332,500 | .... | .... |
| Petromin-Shell–Al-Jubail[1] | 284,000 | .... | [6]19,000 |
| Riyadh Oil Refinery–Riyadh[2] | 134,000 | .... | [2]28,600<br>[5]5,400 |
| Yanbu Petromin Refinery–Yanbu | 170,000 | .... | [2]35,000 |
| **Total** | **1,862,500** | **87,541** | **183,922** |

Solvent extraction: [1]14,000 b/cd. [2]8,800 b/cd.

## SENEGAL

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Ste. Africaine de Raffinage–M'Bao (Dakar) | **24,000** | .... | **[4]2,000** |

## SIERRA LEONE

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Sierra Leone Petroleum Refining Co.–Freetown | **10,000** | .... | .... |

## SINGAPORE

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| BP Refinery Singapore PL–Pasir Panjang | 28,000 | .... | .... |
| Esso Singapore PL–Pulau Ayer Chawan | 205,000 | .... | [2]11,400 |
| Mobil Oil Singapore PL–Jurong | 223,000 | .... | [2]18,000 |
| Shell Eastern Petroleum Ltd.–Pulau Bukom | 258,000 | .... | [2]6,800<br>[6]13,900 |
| Singapore Petroleum CPL†–Pulau Merlimau | 179,000 | .... | [4]13,500 |
| **Total** | **893,000** | .... | **63,600** |

†Singapore Petroleum CPL shares percentages of refinery capacities.

## SOMALIA

| WORLDWIDE REFINING | Crude capacity | Catalytic cracking | Cat reforming |
|---|---|---|---|
| Iraqsoma Ref. Co.–Mogadishu | **10,000** | .... | .... |

| WORLDWIDE REFINING | b/cd Crude capacity | b/cd Catalytic cracking | b/cd Cat reforming |
|---|---|---|---|
| **SOUTH AFRICA** | | | |
| Caltex Oil SA PL–Cape Town | 90,000 | [1]25,000 | [2]10,500 |
| Gencor–Durban | 65,000 | [1]15,000 | [2]15,000 |
| National Petroleum Refiners of South Africa PL–Sasolburg OFS | 75,500 | [1]17,400 | [2]11,100 |
| Shell and BP South Africa Petroleum Refineries PL–Durban | 200,000 | [1]27,000 | [3]26,000 |
| **Total** | **430,500** | **84,400** | **62,600** |
| **SPAIN** | | | |
| Asfaltos Españoles SA–Tarragona | 21,000 | .... | .... |
| Cia. Española de Petróles– San Roque (Cádiz) | 160,000 | [1]36,000 | [2]35,000 |
| Tenerife | 130,000 | .... | [2]14,000 |
| Ertoil, SA–La Rábida, Huelva | 80,000 | .... | [2]14,100 |
| Petrómed—Castellón de la Plana | 120,000 | [1]23,300 | [2]18,000 |
| Petronor SA–Somorrostro, Vizcaya | 240,000 | [1]40,000 | [3]33,500 |
| Repsol Petroleo SA– Cartagena, Murcia | 120,000 | .... | [2]25,000 |
| La Coruña | 135,000 | [1]28,000 | [2]22,000 |
| Puertollano, Ciudad Real | 135,000 | [1]30,000 | [2]18,000 |
| Tarragona | 180,000 | .... | [2]16,000 |
| **Total** | **1,321,000** | **157,300** | **195,600** |
| **SRI LANKA** | | | |
| Ceylon Petroleum Corp.– Sapugaskanda | 50,000 | .... | [3]3,750 |
| **Total** | **50,000** | .... | **3,750** |
| **SUDAN** | | | |
| Port Sudan Refinery Ltd.– Port Sudan | **21,700** | .... | [1]**1,900** |
| **SWEDEN** | | | |
| AB Nynas Petroleum–Gothenburg | 12,500 | .... | .... |
| Nynäshamn | 28,000 | .... | .... |
| BP Raffinaderi–Gothenburg | 106,000 | .... | [2]20,500 |
| Shell Raffinaderi BV–Gothenburg | 81,000 | .... | [2]17,000 |
| Skandinaviska Raffinaderi AB– Brofjorden-Lysekil | 207,000 | [1]28,500 | [4]38,000 |
| **Total** | **434,500** | **28,500** | **75,500** |
| **SWITZERLAND** | | | |
| Raffinerie de Cressier SA–Cressier | 60,000 | .... | [2]16,000 |
| Raffinerie du Sud-Ouest SA– Collombey | 72,000 | .... | [2]10,000 |
| **Total** | **132,000** | .... | **26,000** |
| **SYRIA** | | | |
| Banias Refining Co.–Banias | 120,000 | .... | [6]20,000 |
| Homs Refinery Co.–Homs | 117,394 | .... | [2]2,266<br>[4]9,086 |
| **Total** | **237,394** | .... | **31,352** |
| **TAIWAN** | | | |
| Chinese Petroleum Corp.– Kaohsiung | 425,000 | [1]45,200 | [2]36,160 |
| Tao-Yuan | 117,500 | .... | [2]20,340 |
| **Total** | **542,500** | **45,200** | **56,500** |
| **TANZANIA** | | | |
| Tanzanian & Italian Petroleum Refining CL–Kigamboni, Dar es Salaam | 17,000 | .... | [2]2,500 |
| **Total** | **17,000** | .... | **2,500** |
| **THAILAND** | | | |
| Esso Standard Thailand Ltd.– Sriracha | 75,000 | .... | [5]8,800 |
| Petroleum Authority of Thailand– Bangchak, Bangkok | 61,750 | .... | [2]9,450 |
| Thai Oil CL–Sriracha | 83,800 | [1]10,200<br>[2]15,900 | [1]2,700<br>[3]6,600 |
| **Total** | **220,550** | **26,100** | **27,550** |
| **TRINIDAD** | | | |
| Trinidad and Tobago Oil CL– Pointe-a-Pierre | 166,000 | [1]26,000 | [3]22,200 |
| Point Fortin | 80,000 | .... | [5]5,700 |
| **Total** | **246,000** | **26,000** | **27,900** |
| **TUNISIA** | | | |
| Ste. Tunisienne Industries des Raffinage–Bizerte | **34,000** | .... | **3,300** |
| **TURKEY** | | | |
| Anadolu Tasfiyehanesi AS–Mersin | 90,000 | .... | [2]12,000 |
| Turkish Petroleum Refineries Corp.–Aliaga, Izmir[1] | 226,440 | [1]14,000 | [3]9,056 |
| Batman, Siirt | 25,000 | [2]5,000 | [2]1,400 |
| Izmit | 226,440 | [1]22,644 | [3]20,285 |
| Kirikkale | 135,700 | .... | [2]20,342 |
| **Total** | **703,580** | **41,644** | **63,083** |

Solvent extraction: [1]11,700 b/cd (furfural), 6,700 b/cd (propane deasphalting).

| WORLDWIDE REFINING | b/cd Crude capacity | b/cd Catalytic cracking | b/cd Cat reforming |
|---|---|---|---|
| **UNITED KINGDOM** | | | |
| **England** | | | |
| Conoco Ltd.–South Killingholme | 130,000 | [1]47,000 | [2]46,000 |
| Eastham Refinery Ltd.–Eastham, Ellesmere Port | 22,000 | .... | .... |
| Esso Petroleum CL–Fawley | 302,400 | [1]76,500 | [2]35,300<br>[4]22,500 |
| Lindsey Oil Refinery Ltd.– Killingholm, South Humberside | 190,000 | [1]45,000 | [2]33,600 |
| Mobil Oil CL–Coryton, Essex | 152,000 | [1]52,000 | [4]32,000 |
| Phillips Imperial Petroleum Ltd.– Port Clarence | 100,000 | .... | .... |
| Shell U.K. Ltd.–Shell Haven | 92,000 | .... | [6]32,000 |
| Stanlow | 262,000 | [1]59,000 | [2]29,000<br>[6]27,000 |
| **Total** | **1,250,400** | **279,500** | **257,400** |
| **Scotland** | | | |
| BP Refinery Grangemouth Ltd.– Grangemouth | 198,500 | [1]21,000 | [2]32,000 |
| Briggs Oil Ltd.—Dundee | 10,240 | .... | .... |
| **Total** | **208,740** | **21,000** | **32,000** |
| **Wales** | | | |
| BP Refinery Llandarcy Ltd.– Llandarcy, Neath | .... | .... | .... |
| Elf Oil (G.B.) Ltd.–Milford Haven | 108,000 | [1]32,500 | [2]17,800 |
| Gulf Oil-GB–Milford Haven | 109,000 | [1]31,500 | [2]22,000 |
| Pembroke Cracking Co. (65% Texaco, 35% Gulf Oil-GB)— Milford Haven | .... | [1]90,000 | .... |
| Texaco Ltd.–Pembroke, Dyfed | 180,000 | .... | [6]39,000 |
| **Total** | **397,000** | **154,000** | **78,800** |
| **Total United Kingdom** | **1,856,140** | **454,500** | **368,200** |

†Dimersol.

| Company and refinery location | Crude b/cd | b/sd Catalytic cracking | b/sd Catalytic reforming |
|---|---|---|---|
| **UNITED STATES** | | | |
| **Alabama** | | | |
| Coastal Mobile Refining Co.— Mobile Bay | *14,250 | ...... | ...... |
| Gamxx Energy Inc.—Theodore | 26,500 | [2]5,000 | .... |
| Hunt Refining Co.—Tuscaloosa | 33,500 | [2]7,500 | [2]9,800<br>[4]5,000 |
| Louisiana Land & Exploration Co.—Saraland | 80,000 | [2]20,000 | ..... |

| Company and refinery location | Crude | —— b/sd —— | |
|---|---|---|---|
| | b/cd | Catalytic cracking | Catalytic reforming |
| **Total** | **154,250** | **32,500** | **14,800** |
| **Alaska** | | | |
| ARCO Alaska Inc.—Kuparuk | 12,000 | ...... | ...... |
| Prudhoe Bay | 17,500 | ...... | ...... |
| Mapco Alaska Petroleum—North Pole | 115,000 | ...... | ...... |
| | ...... | ...... | |
| Petro Star Inc.—North Pole | 8,000 | ...... | ...... |
| Tesoro Petroleum Corp.—Kenai | 72,000 | [4]12,000 | ...... |
| **Total** | **224,500** | **12,000** | ...... |
| **Arizona** | | | |
| Intermountain Refining CI—Fredonia | 5,710 | ...... | ...... |
| Sunbelt Refining Co.—Randolph | 8,500 | .... | .... |
| **Total** | **14,210** | ...... | ...... |
| **Arkansas** | | | |
| Berry Petroleum Co.—Stevens | *5,700 | ...... | ...... |
| Cross Oil & Refining Co. Inc.—Smackover | 6,770 | ...... | ...... |
| Lion Oil Co.—El Dorado[1] | 48,000 | [2]9,000 | ...... |
| **Total** | **60,470** | **9,000** | ...... |

Solvent extraction: [1]5,500 b/d.

| Company and refinery location | Crude b/cd | Catalytic cracking | Catalytic reforming |
|---|---|---|---|
| **California** | | | |
| Anchor Refining Co.Inc.—McKittrick | 10,000 | ...... | ...... |
| Atlantic Richfield Co.—Carson | 223,000 | [2]48,000 | ...... |
| Chemoil Refining Corp.—Signal Hill | 14,200 | ...... | ...... |
| Chevron U.S.A. Inc.—El Segundo | 254,000 | [2]51,000 | [1]40,000<br>[2]60,000<br>[5]14,000 |
| Richmond[1] | 205,000 | [2]60,000 | [2]60,000<br>[4]65,000 |
| Conoco Inc.—Santa Maria | 9,500 | ...... | ...... |
| Edgington Oil Co. Inc.—Long Beach | 41,600 | ...... | ...... |
| Exxon Co.—Benicia | 128,000 | [3]32,000 | [2]37,000 |
| Fletcher Oil & Refining Co.—Carson | 29,657 | [4]5,100 | [2]12,000 |
| Golden West Refining Co.—Santa Fe Springs | 44,000 | [2]19,000 | ...... |
| Huntway Refining Co.—Benicia | 8,400 | ...... | ...... |
| Wilmington | 5,500 | ...... | ...... |
| Kern Oil & Refining Co.—Bakersfield | 20,000 | [2]3,000 | ...... |
| Lunday-Thagard Co.—South Gate | 7,000 | ...... | ...... |
| Mobil Oil Corp.—Torrance | 123,000 | [2]36,000 | [3]68,000 |
| Pacific Refining Co.—Hercules | *52,250 | [2]15,000 | ...... |
| Paramount Petroleum Corp.—Paramount | 42,700 | [4]8,500 | [2]9,000 |
| Powerine Oil Co.—Santa Fe Springs | 46,500 | [2]10,000 | [3]13,500<br>[4]6,000 |
| San Joaquin Refining CI—Bakersfield | 18,000 | ...... | ...... |
| Shell Oil Co.—Martinez | 140,100 | [3]28,000 | [3]50,000 |
| Wilmington | 133,300 | [2]24,000 | [3]11,000 |
| Sunland Refining Corp.—Bakersfield | 15,000 | [2]1,500 | ...... |
| Ten By, Inc.—Oxnard | 4,000 | ...... | ...... |
| Texaco Refining & Marketing Inc.—Bakersfield | *49,400 | [2]23,000 | [2]16,000 |
| Wilmington | *95,000 | [2]40,000 | [3]30,000 |
| Tosco Corp.—Martinez | 132,000 | [2]20,000<br>[5]23,000 | [2]54,000 |
| Ultramar, Inc.—Wilmington | 68,000 | [6]14,500 | [3]42,000 |
| Unocal Corp.—Los Angeles | 108,000 | [2]52,000 | ...... |
| San Francisco (includes Santa Maria) | 113,100 | [2]34,000 | ...... |
| Witco Chemical Corp.,Golden Bear Division—Oildale | 10,348 | ...... | ...... |
| **Total** | **2,150,555** | **547,800** | **587,500** |

Solvent extraction: [1]55,000 b/sd.

| Company and refinery location | Crude b/cd | Catalytic cracking | Catalytic reforming |
|---|---|---|---|
| **Colorado** | | | |
| Colorado Refining Co.—Commerce City | 28,000 | [2]9,500 | ...... |
| Conoco Inc.—Denver | 48,000 | [2]10,000 | ...... |
| Landmark Petroleum Inc.—Fruita | 15,200 | [2]3,400 | .... |
| **Total** | **91,200** | **22,900** | ...... |
| **Delaware** | | | |
| Star Enterprise—Delaware City | 140,000 | [2]11,000<br>[5]41,000 | ......<br>*5,600 |
| **Total** | **140,000** | **52,000** | ...... |
| **Georgia** | | | |
| Amoco Oil Co.—Savannah | 28,000 | ...... | ...... |
| Young Refining Corp.—Douglasville | 7,500 | ...... | ...... |
| **Total** | **35,500** | ...... | ...... |
| **Hawaii** | | | |
| Chevron U.S.A. Inc.—Barber's Point | 52,800 | ...... | ...... |
| Hawaiian Independent Refinery Inc.—Ewa Beach | *90,250 | [2]13,000 | ...... |
| **Total** | **143,050** | **13,000** | ...... |

†Dimersol.

| Company and refinery location | Crude b/cd | Catalytic cracking | Catalytic reforming |
|---|---|---|---|
| **Illinois** | | | |
| Clark Oil & Refining Corp.—Blue Island | 66,500 | [2]30,500 | ...... |
| Hartford | 57,000 | [2]12,000 | ...... |
| Indian Refining Co.—Lawrenceville | 54,000 | [2]15,000 | ...... |
| Marathon Oil Co.—Robinson | 170,000 | [4]36,500<br>[5]39,500 | ...... |
| Mobil Oil Corp.—Joliet | 180,000 | [2]46,000 | ...... |
| Shell Oil Co.—Wood River | 274,000 | [2]18,000<br>[3]75,000 | [3]29,000 |
| Uno-Ven Co.—Lemont | 147,000 | [2]29,800 | ...... |
| **Total** | **948,500** | **302,300** | **29,000** |
| **Indiana** | | | |
| Amoco Oil Co.—Whiting | 350,000 | [4]90,000 | [3]94,000 |
| Countrymark Cooperative, Inc. Mt. Vernon | 20,600 | [2]4,000 | ...... |
| Laketon Refining Corp.—Laketon | 8,300 | ...... | ...... |
| Marathon Oil Co.—Indianapolis[1] | 50,000 | [1]10,500 | ...... |
| **Total** | **428,900** | **104,500** | **94,000** |

Solvent extraction: [1]5,000.

| Company and refinery location | Crude b/cd | Catalytic cracking | Catalytic reforming |
|---|---|---|---|
| **Kansas** | | | |
| Coastal Refining and Marketing Inc.—Augusta | ...... | [4]10,000 | ...... |
| El Dorado[1] | *30,400 | [2]4,500 | ...... |
| Wichita | *29,925 | [2]6,500 | ...... |
| Farmland Industries Inc.—Coffeyville | 59,600 | [2]16,000 | ...... |
| Phillipsburg | 26,400 | [2]5,300 | ...... |
| National Cooperative Refinery Association—McPherson | 70,900 | [2]15,000 | ...... |
| Texaco Refining & Marketing Inc.—El Dorado | 80,000 | [2]25,500 | [3]44,000 |
| Total Petroleum Inc.—Arkansas City | 56,000 | [2]18,000 | ...... |
| **Total** | **353,225** | **100,800** | **44,000** |

Solvent extraction: [1]5,500 b/sd. † Includes $C_5$-$C_6$ Isom. feed.

| Company and refinery location | Crude b/cd | Catalytic cracking | Catalytic reforming |
|---|---|---|---|
| **Kentucky** | | | |
| Ashland Petroleum Co.—Catlettsburg | 213,400 | [2]18,000<br>[5]27,000 | [3]40,000 |
| Somerset Refinery Inc.—Somerset | 5,500 | [2]1,000 | [4]400 |
| **Total** | **218,900** | **46,000** | **40,400** |

†ART. §Reduced crude converter. ∫Aromatics 5,000. C3/C4 12,000. C5/C6 12,000.

| Company and refinery location | Crude b/cd | Catalytic cracking | Catalytic reforming |
|---|---|---|---|
| **Louisiana** | | | |
| American International Refinery, Inc.—Lake Charles | *28,500 | ..... | ..... |

| | | b/sd | |
|---|---|---|---|
| **Company and refinery location** | **Crude b/cd** | **Catalytic cracking** | **Catalytic reforming** |
| Atlas Processing Co., Division of Pennzoil—Shreveport | 46,200 | [2]5,000 | ...... |
| BP Oil Co.—Belle Chasse | *218,500 | [2]37,400 | ...... |
| Calcasieu Refining Co.—Lake Charles | 13,500 | ...... | ...... |
| Calumet Lubricants Co.—Princeton | 4,376 | ...... | ...... |
| Canal Refining Co.—Church Point | 9,865 | [1]1,900 | ...... |
| CAS Refining Inc.—Mermentau | 15,000 | ...... | ...... |
| Citgo Petroleum Corp.—Lake Charles | 320,000 | [2]52,000<br>[5]54,000 | [3]40,000 |
| Conoco Inc.—Lake Charles | 159,500 | [2]16,000<br>[5]12,000 | ...... |
| Exxon Co.—Baton Rouge[1] | 421,000 | [4]90,000 | ...... |
| Kerr-McGee Refining Corp.—Cotton Valley | 7,800 | ...... | ...... |
| Marathon Oil Co.—Garyville[4] | 225,000 | [5]45,000 | [2]71,000<br>[4]38,000 |
| Mobil Oil Corp.—Chalmette | 160,000 | [2]28,000<br>[4]19,000 | [3]43,000 |
| Murphy Oil USA Inc.—Meraux[2] | 97,000 | [6]23,000 | [4]15,000 |
| Phibro Refining Inc.—Krotz Springs | 56,700 | [2]12,000 | ...... |
| St. Rose | 28,300 | ...... | ...... |
| Placid Refining Co.—Port Allen[3] | 48,000 | [2]10,000 | ...... |
| Shell Oil Co.—Norco | 215,000 | [2]16,000<br>[3-4]38,000 | [3]70,000 |
| Star Enterprise—Convent | 225,000 | [2]40,000 | ...... |
| **Total** | **2,290,241** | **409,300** | **277,000** |

Solvent extraction: [1]6,900 b/sd. [2]15,000 b/sd. [3]5,000 b/sd. [4]30,000 b/sd.
ʃ Wax 1,200. Lube 5,500.
† Wax 2,000. Alky feed 43,000. § Dimersol.

| | | | |
|---|---|---|---|
| **Michigan** | | | |
| Crystal Refining Co.—Carson City | 4,000 | ...... | ...... |
| Lakeside Refining Co.—Kalamazoo | 5,600 | [1]1,000 | ...... |
| Marathon Oil Co.—Detroit | 70,000 | [2]18,500 | [3]14,000<br>[4]3,000 |
| Total Petroleum Inc.—Alma | 45,600 | [2]14,000 | ...... |
| **Total** | **125,200** | **33,500** | **17,000** |
| **Minnesota** | | | |
| Ashland Petroleum Co.—St. Paul Park | 67,100 | [2]23,500 | [3]23,000 |
| Koch Refining Co.—Rosemount | *218,500 | [2]6,000<br>[6]26,000 | [3]63,500 |
| **Total** | **285,600** | **55,500** | **86,500** |

†Dimersol.

| | | | |
|---|---|---|---|
| **Mississippi** | | | |
| Amerada-Hess Corp.—Purvis | 30,000 | [2]5,800 | ...... |
| Chevron U.S.A. Inc.—Pascagoula | 295,000 | [2]90,000 | [1]96,000<br>[3]63,000<br>[4]30,000 |
| Ergon Refining Inc.—Vicksburg | 16,800 | ...... | [5]3,800 |
| Southland Oil Co.—Lumberton | 5,800 | ...... | ...... |
| Sandersville | 11,000 | ...... | ...... |
| **Total** | **358,600** | **95,800** | **102,800** |
| **Montana** | | | |
| Cenex—Laurel[1] | 40,400 | [2]12,000 | [4]14,000 |
| Conoco Inc.—Billings[2] | 49,500 | [2]14,700 | ...... |
| Exxon Co.—Billings | 42,000 | [1]10,000 | ...... |
| Montana Refining Co.—Great Falls | 7,000 | [2]1,000 | ...... |
| **Total** | **138,900** | **37,700** | **14,000** |

Solvent extraction: [1]4,000 b/sd. [2]7,500 b/sd (PDA).

| | | | |
|---|---|---|---|
| **Nevada** | | | |
| Petro Source Refining Partners—Tonopah | **4,500** | ...... | ...... |
| **New Jersey** | | | |
| Amerada-Hess Corp.—Port Reading | ...... | ...... | ...... |
| Chevron U.S.A. Inc.—Perth Amboy | 80,000 | ...... | ...... |
| Coastal Eagle Point Oil Co.—Westville | *109,250 | [2]27,000 | ...... |
| Exxon Co.—Linden | 130,000 | [2]28,000 | [2]50,000 |
| Mobil Oil Corp.—Paulsboro[1] | 100,000 | [2]23,500 | [5]15,000 |

| | | b/sd | |
|---|---|---|---|
| **Company and refinery location** | **Crude b/cd** | **Catalytic cracking** | **Catalytic reforming** |
| Seaview Petroleum Co. L.P.—Thorofare | 80,000 | ...... | ...... |
| **Total** | **499,250** | **78,500** | **65,000** |

Solvent extraction: [1]9,500 b/sd. †Cumene.

| | | | |
|---|---|---|---|
| **New Mexico** | | | |
| Bloomfield Refining Co.—Bloomfield | 16,150 | [2]4,000 | ...... |
| Giant Industries Inc.—Gallup | 20,000 | [2]6,800 | ...... |
| Navajo Refining Co.—Artesia | *38,000 | [2]8,000 | ...... |
| Thriftway Marketing Corp.—Farmington | 2,500 | [2]500 | ...... |
| **Total** | **78,650** | **19,300** | ...... |
| **New York** | | | |
| Cibro Petroleum Products Co.—Albany | **39,900** | ...... | ...... |
| **North Dakota** | | | |
| Amoco Oil Co.—Mandan | 58,000 | [2]12,100 | ...... |
| **Total** | **58,000** | **12,100** | ...... |
| **Ohio** | | | |
| Ashland Petroleum Co.—Canton | 66,000 | [5]20,000 | [3]23,000 |
| BP Oil Co.—Lima | *142,500 | [4]55,000 | ...... |
| Toledo | *120,650 | [3]23,000<br>[4]19,000 | ...... |
| Sun Refining & Maketing Co.—Toledo[1] | 125,000 | [2]45,600 | ...... |
| **Total** | **454,150** | **182,600** | **23,000** |

Solvent extraction: [1]9,000 b/sd.

| | | | |
|---|---|---|---|
| **Oklahoma** | | | |
| Barrett Refining Corp.—Thomas | 11,000 | ...... | ...... |
| Conoco Inc.—Ponca City | 140,000 | [2]36,000 | ...... |
| Cyril Petrochemical Corp.—Cyril | 12,500 | ...... | ...... |
| Kerr-McGee Refining Corp.—Wynnewood[1] | 43,000 | [6]12,500 | ...... |
| Sinclair Oil Corp.—Tulsa | 50,000 | [1]12,000 | ...... |
| Sun Refining & Marketing Co.— Tulsa[2] | 85,000 | [2]24,000 | ...... |
| Total Petroleum Inc.—Ardmore | 68,000 | [6]17,000 | [3]26,000 |
| **Total** | **409,500** | **101,500** | **26,000** |

Solvent extraction: [1]5,000 b/sd. [2]10,000 b/sd.

| | | | |
|---|---|---|---|
| **Oregon** | | | |
| Chevron U.S.A. Inc.—Portland | ...... | ...... | ...... |
| **Pennsylvania** | | | |
| BP Oil Co.—Marcus Hook | *171,000 | [6]50,000 | [3]42,000 |
| Chevron U.S.A. Inc.—Philadelphia | 175,000 | [2]34,000 | ...... |
| Pennzoil Products Co.—Rouseville | 15,700 | [2]5,820 | ...... |
| Sun Refining & Marketing Co.—Marcus Hook | 175,000 | [2]24,000 | ...... |
| Philadelphia | 130,000 | [2]50,000 | ...... |
| United Refining Co.—Warren | *64,600 | [2]16,000 | ...... |
| Witco Chemical Co.—Bradford | 10,000 | [2]1,800 | ...... |
| **Total** | **741,300** | **181,620** | **42,000** |

Solvent extraction: [1]730 b/sd

| | | | |
|---|---|---|---|
| **Tennessee** | | | |
| Mapco Petroleum Inc.—Memphis | 75,000 | [2]14,000 | ...... |
| **Total** | **75,000** | **14,000** | ...... |
| **Texas** | | | |
| Amoco Oil Co.—Texas City | 433,000 | [2]160,000 | [3]85,000 |
| Chevron U.S.A. Inc.—El Paso | 66,000 | [3]25,000 | [4]8,000 |
| Port Arthur | 315,300 | [2]23,000<br>[4]44,100 | ...... |
| Citgo—Corpus Christi | 132,500 | [5]54,000 | [2]65,000<br>[4]41,700 |
| Coastal Refining & Marketing Inc.—Corpus Christi | *90,250 | [2]11,000<br>[6]17,500 | ...... |
| Crown Central Petroleum Corp.—Houston | 100,000 | [2]14,000<br>[6]22,000 | [4]10,000 |

| Company and refinery location | Crude b/cd | b/sd<br>Catalytic cracking | <br>Catalytic reforming |
|---|---|---|---|
| Diamond Shamrock Corp.— Sunray[1] | 111,000 | [2]15,000<br>[5]25,000 | ...... |
| Three Rivers[2] | 53,000 | [2]9,000<br>[5]10,000 | ...... |
| El Paso Refining Co. Ltd.—El Paso | *52,250 | [2]7,200 | ...... |
| Exxon Co. U.S.A.—Baytown[3] | 395,000 | [3]60,000<br>[4]63,000 | [2]110,000 |
| Fina Oil & Chemical Co.— Big Spring[4] | 55,000 | [2]20,000 | [2]6,000 |
| Port Arthur[5] | 110,000 | [5]34,000 | [2]18,000<br>[3]13,000 |
| Howell Hydrocarbons Inc.— San Antonio | 1,900 | ...... | ...... |
| Koch Refining Co.—Corpus Christi | 125,000 | [3]15,000<br>[6]33,500 | ...... |
| LaGloria Oil & Gas Co.—Tyler | 49,500 | [2]4,000<br>[5]11,700 | ...... |
| Leal Petroleum Corp.—Nixon | 12,000 | ...... | ...... |
| Liquid Energy Corp.—Bridgeport | 10,000 | ...... | ...... |
| Lyondell Petrochemical Co.— Houston[7] | 265,000 | [2]110,000 | [3]48,000<br>[4]46,000<br>[5]35,000 |
| Marathon Oil Co.—Texas City | 70,000 | [1]10,500 | ...... |
| Mobil Oil Corp.—Beaumont | 275,000 | [2]57,000<br>[5]46,000 | ...... |
| Phibro Refining Inc.—Houston[6] | 67,000 | [2]13,500 | ...... |
| Texas City | 123,500 | [2]11,000<br>[6]12,000 | ...... |
| Phillips 66 Co.—Borger | 105,000 | [2]26,000 | [1]50,000<br>[4]40,000 |
| Sweeny | 175,000 | [2]36,000 | [1]75,000<br>[4]50,000 |
| Pride Refining Inc.—Abilene | 45,500 | [2]6,000 | ...... |
| Shell Oil Co.—Deer Park | 215,900 | [2]20,000<br>[4]43,000 | [3]45,000 |
| Odessa | 28,600 | [2]10,000 | ...... |
| Southwestern Refining Co., Inc.— Corpus Christi | 104,000 | [2]30,000 | [1]18,000 |
| Star Enterprise— Port Arthur | 250,000 | [5]50,000 | ...... |
| Trifinery—Corpus Christi | 18,000 | ...... | ...... |
| Valero Refining Co.— Corpus Christi | 27,000 | [6]27,000 | [1]60,000 |
| **Total** | **3,882,200** | **1,186,000** | **823,700** |

Solvent extraction: [1]15,000 b/sd. [2]7,000 b/sd. [3]53,000 b/sd. [4]10,000 b/sd. [5]18,000 b/sd. [6]17,000 b/sd. [7]6,000 b/sd.
†Heavy oil cracker. §Dimersol.

**Utah**

| | | | |
|---|---|---|---|
| Amoco Oil Co.—Salt Lake City | 40,000 | [4]7,600 | ...... |
| Big West Oil Co.—Salt Lake City | 24,000 | [2]5,000 | ...... |
| Chevron U.S.A.—Salt Lake City | 45,000 | [2]7,500 | [5]6,000 |
| Crysen Refining Inc.— Woods Cross | 12,500 | [2]3,000 | ...... |
| Pennzoil Products Co.—Roosevelt | 8,000 | [2]2,000 | ...... |
| Phillips 66 Co.—Woods Cross[1] | 25,000 | [2]6,000 | [4]1,600 |
| **Total** | **154,500** | **31,100** | **7,600** |

Solvent extraction: [1]5,000 b/sd.

**Virginia**

| | | | |
|---|---|---|---|
| Amoco Oil Co.—Yorktown | 53,000 | [4]10,200 | ...... |
| **Total** | **53,000** | **10,200** | ...... |

**Washington**

| | | | |
|---|---|---|---|
| Atlantic Richfield Co.—Ferndale | 167,000 | [2]56,000 | [4]18,000 |
| BP Oil Co.—Ferndale | *90,250 | [4]16,500 | ...... |
| Chevron U.S.A. Inc.—Seattle | ...... | ...... | ...... |
| Shell Oil Co.—Anacortes | 89,300 | [3]26,000 | [3]7,500 |
| Sound Refining Inc.—Tacoma | 11,900 | ...... | ...... |
| Texaco Refining & Marketing Inc.— Anacortes[1] | 132,000 | [2]30,000 | ...... |
| U.S. Oil & Refining Co.—Tacoma | 32,775 | [1]6,000 | ...... |
| **Total** | **323,225** | **134,500** | **25,500** |

Solvent extraction: [1]4,500 b/sd.

**West Virginia**

| | | | |
|---|---|---|---|
| Phoenix Refining Co.— St. Mary's[1] | 19,180 | [1]1,500 | ...... |

| Company and refinery location | Crude b/cd | b/sd<br>Catalytic cracking | <br>Catalytic reforming |
|---|---|---|---|
| Quaker State Oil Refining Corp.— Newell | 10,500 | [2]3,400 | ...... |
| **Total** | **29,680** | **4,900** | ...... |

Solvent extraction: [1]1,000 b/sd.

**Wisconsin**

| | | | |
|---|---|---|---|
| Murphy Oil USA Inc.—Superior | **32,000** | **[2]8,000** | **[4]5,800** |

**Wyoming**

| | | | |
|---|---|---|---|
| Frontier Oil & Refining Co.— Cheyenne | 35,000 | [2]6,600 | ...... |
| Little America Refining Co.— Casper | 22,000 | [3]6,000 | ...... |
| Sinclair Oil Corp.—Sinclair | 54,000 | [2]14,500 | [3]21,000 |
| Wyoming Refining Co.—Newcastle | 11,900 | [1]2,750 | ...... |
| **Total** | **122,900** | **29,850** | **21,000** |

| WORLDWIDE REFINING | b/cd<br>Crude capacity | <br>Catalytic cracking | <br>Cat reforming |
|---|---|---|---|

## URUGUAY

| | | | |
|---|---|---|---|
| Ancap–La Teja, Montevideo | 28,500 | [1]4,750 | [1]2,850 |
| **Total Uruguay** | **28,500** | **4,750** | **2,850** |

## U.S.S.R.

Government-owned refineries at Achinsk, Angarsk, Baku, Batumi, Chimkent, Drogobych, Fergana, Gorki, Grozny, Guryev, Ishimbai, Khabarovsk, Kherson, Kirishi, Komsomolsk, Krasnovodsk, Kremenchug, Kuibyshev, Lisichansk, Mazheikiai, Moscow, Mozyr, Nadvornaya, Nizhnekamsk, Odessa, Omsk, Orsk, Pavlodar, Perm, Polotsk, Ryazan, Saratov, Syzran, Tuapse, Ufa, Ukhta, Vannovskiy, Volgograd, and Yaroslavl.

| | | | |
|---|---|---|---|
| **Total** | **12,300,000** | | |

## VENEZUELA

| | | | |
|---|---|---|---|
| Corpoven–El Palito, Carabobo | 105,000 | [1]50,400 | [2]8,900 |
| El Toreño, Barinas | 4,800 | .... | .... |
| Puerto La Cruz, Anzoategui | 199,000 | [1]13,600 | .... |
| San Roque, Anzoategui | 5,200 | .... | .... |
| Lagoven–Judibana, Falcon | 571,000 | [1]97,200 | .... |
| Maraven–Punta Cardon, Falcon | 286,000 | [1]59,500 | .... |
| **Total** | **1,171,000** | **220,700** | **8,900** |

## VIRGIN ISLANDS

| | | | |
|---|---|---|---|
| Hess Oil Virgin Islands Corp.– St. Croix | 545,000 | .... | [2]125,000 |
| **Total** | **545,000** | .... | **125,000** |

## YEMEN

| | | | |
|---|---|---|---|
| Aden Refinery Co.–Little Aden[1] | 104,500 | .... | [1]7,600 |
| Yemen Hunt Oil Co.–Marib | 10,000 | .... | [1]2,500 |
| **Total** | **114,500** | .... | **10,100** |

Solvent extraction: [1]7,920 b/cd.

## YUGOSLAVIA

| | | | |
|---|---|---|---|
| Bosanski Brod[1] | 112,835 | .... | [2]7,612<br>[6]13,500 |
| Lendava | 14,600 | .... | .... |
| Novi Sad | 63,000 | .... | [2]8,200 |
| Pancevo | 108,000 | [1]20,750 | [2]8,800 |
| Rijeka | 160,000 | [1]21,300 | [2]17,500 |
| Sisak | 150,000 | [3]10,000 | [2]19,000 |
| Zagreb | 700 | .... | .... |
| **Total** | **609,135** | **52,050** | **74,612** |

Solvent extraction: [1]3,300 b/cd (deasphalting).

## ZAIRE

| | | | |
|---|---|---|---|
| Sozir–Muanda | **17,000** | .... | **[3]3,000** |

## ZAMBIA

| | | | |
|---|---|---|---|
| Indeni Petroleum Refinery Co.– Bwana Mkubwa Area, Ndola | **23,700** | .... | **[3]5,330** |

# ERRATA

Your copy of the 1992 International Petroleum Encyclopedia contains many errors in the U.S. section of the world refining survey.

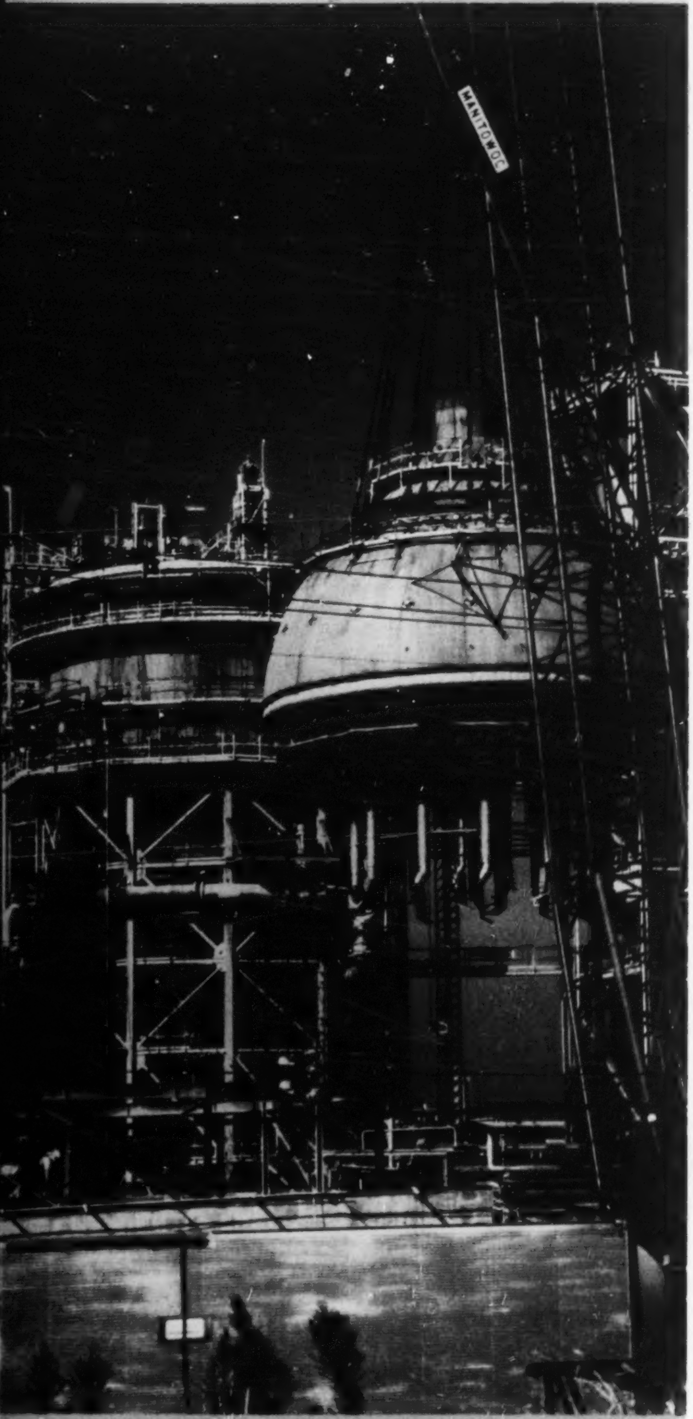
Here is the correct version of that section, which appears on pp. 335-338.

IPE regrets the errors.

| Company and refinery location | Crude b/cd | b/sd | |
|---|---|---|---|
| | | Catalytic cracking | Catalytic reforming |
| **UNITED STATES** | | | |
| **Alabama** | | | |
| Coastal Mobile Refining Co. — Mobile Bay | 14,250 | | |
| Gamxx Energy Inc. — Theodore | 26,500 | | 5,000 |
| Hunt Refining Co. — Tuscaloosa | 33,500 | | 7,500 |
| Louisiana Land & Exploration Co. — Saraland | 80,000 | | 20,000 |
| **Total** | **154,250** | ...... | **32,500** |
| **Alaska** | | | |
| ARCO Alaska Inc. — Kuparuk | 12,000 | | |
| Prudhoe Bay | 17,500 | | |
| Mapco Alaska Petroleum — North Pole | 115,000 | | |
| Petro Star Inc. — North Pole | 8,000 | | |
| Tesoro Petroleum Corp. — Kenai | 72,000 | | 12,000 |
| **Total** | **224,500** | ...... | **12,000** |
| **Arizona** | | | |
| Intermountain Refining Cl — Fredonia | 5,710 | | |
| Sunbelt Refining Co. — Randolph | 8,500 | | |
| **Total** | **14,210** | ...... | ...... |
| **Arkansas** | | | |
| Berry Petroleum Co. — Stevens | 5,700 | | |
| Cross Oil & Refining Co. Inc. — Smackover | 6,770 | | |
| Lion Oil Co. — El Dorado | 48,000 | 18,500 | 9,000 |
| **Total** | **60,470** | **18,500** | **9,000** |
| Solvent extraction: 5,500 b/d | | | |
| **California** | | | |
| Anchor Refining Co Inc. — McKittrick | 10,000 | | |
| Atlantic Richfield Co. — Carson | 223,000 | 82,000 | 48,000 |
| Chemoil Refining Corp. — Signal Hill | 14,200 | | |
| Chevron U.S.A. Inc. — El Segundo | 254,000 | 62,000 | 51,000 |
| Richmond | 205,000 | 63,000 | 60,000 |
| Conoco Inc. — Santa Maria | 9,500 | | |
| Edgington Oil Co. Inc. — Long Beach | 41,600 | | |
| Exxon Co. — Benicia | 128,000 | 67,000 | 32,000 |
| Fletcher Oil & Refining Co. — Carson | 29,657 | 12,000 | 5,100 |
| Golden West Refining Co. — Santa Fe Springs | 44,000 | 13,500 | 19,000 |
| Huntway Refining Co. — Benicia | 8,400 | ...... | ...... |
| Wilmington | 5,500 | | ...... |
| Kern Oil & Refining Co. — Bakersfield | 20,000 | ...... | 3,000 |
| Lunday-Thagard Co. — South Gate | 7,000 | ...... | ...... |
| Mobil Oil Corp. — Torrance | 123,000 | 63,000 | 36,000 |
| Pacific Refining Co. — Hercules | 52,250 | ...... | 15,000 |
| Paramount Petroleum Corp. — Paramount | 42,700 | | 8,500 |
| Powerine Oil Co. — Santa Fe Springs | 46,500 | 12,500 | 10,000 |
| San Joaquin Refining Cl — Bakersfield | 18,000 | ...... | ...... |
| Shell Oil Co. — Martinez | 140,100 | 66,000 | 28,000 |
| Wilmington | 133,300 | 42,000 | 24,000 |
| Sunland Refining Corp. — Bakersfield | 15,000 | | 1,500 |
| Ten By, Inc. — Oxnard | 4,000 | | ...... |
| Texaco Refining & Marketing Inc. — Bakersfield | 49,400 | | 23,000 |
| Wilmington | 95,000 | 30,000 | 40,000 |
| Tosco Corp. — Martinez | 132,000 | 62,000 | 20,000<br>23,000 |
| Ultramar, Inc. — Wilmington | 68,000 | 38,000 | 14,500 |
| Unocal Corp. — Los Angeles | 108,000 | 47,000 | 52,000 |
| San Francisco (includes Santa Maria) | 113,100 | | 34,000 |
| Witco Chemical Corp. Golden Bear Division — Oildale | 10,348 | | |
| **Total** | **2,150,555** | **660,000** | **547,600** |
| Solvent extraction: 55,000 b/sd | | | |
| **Colorado** | | | |
| Colorado Refining Co. — Commerce City | 28,000 | 8,500 | 9,500 |
| Conoco Inc. — Denver | 48,000 | 19,000 | 10,000 |
| Landmark Petroleum Inc. — Fruita | 15,200 | | 3,400 |
| **Total** | **91,200** | **27,500** | **22,900** |
| **Delaware** | | | |
| Star Enterprise — Delaware City | 140,000 | 67,000 | 11,000<br>41,000 |
| **Total** | **140,000** | **67,000** | **52,000** |
| **Georgia** | | | |
| Amoco Oil Co. — Savannah | 28,000 | | |
| Young Refining Corp. — Douglasville | 7,500 | | |
| **Total** | **35,500** | ...... | ...... |

| Company and refinery location | Crude b/cd | b/sd<br>Catalytic cracking | b/sd<br>Catalytic reforming |
|---|---|---|---|
| **Hawaii** | | | |
| Chevron U.S.A. Inc.—Barber's Point | 52,800 | [1]20,000 | |
| Hawaiian Independent Refinery Inc.—Ewa Beach | *90,250 | | [2]13,000 |
| **Total** | **143,050** | **20,000** | **13,000** |
| †Dimersol | | | |
| **Illinois** | | | |
| Clark Oil & Refining Corp.—Blue Island | 66,500 | [1]25,000 | [2]30,500 |
| Hartford | 57,000 | [1]26,000 | [2]12,000 |
| Indian Refining Co.—Lawrenceville | 54,000 | [1]34,000 | [2]15,000 |
| Marathon Oil Co.—Robinson | 170,000 | [1]42,000 | [4]36,500<br>[3]39,500 |
| Mobil Oil Corp.—Joliet | 180,000 | [1]98,000 | [2]46,000 |
| Shell Oil Co.—Wood River | 274,000 | [1]94,000 | [2]18,000<br>[3]75,000 |
| Uno-Ven Co.—Lemont | 147,000 | [1]58,000 | [2]29,800 |
| **Total** | **948,500** | **377,000** | **302,300** |
| **Indiana** | | | |
| Amoco Oil Co.—Whiting | 350,000 | [1]145,000 | [4]90,000 |
| Countrymark Cooperative Inc.—Mt. Vernon | 20,600 | [1]7,000 | [2]4,000 |
| Laketon Refining Corp.—Laketon | 8,300 | ...... | ...... |
| Marathon Oil Co.—Indianapolis[1] | 50,000 | [1]20,000 | [1]10,500 |
| **Total** | **428,900** | **172,000** | **104,500** |
| Solvent extraction: [1]5,000 | | | |
| **Kansas** | | | |
| Coastal Refining and Marketing Inc.—Augusta | | | [4]10,000 |
| El Dorado[1] | *30,400 | [1]14,500 | [4]4,500 |
| Wichita | *29,925 | [1]19,000 | [2]6,500 |
| Farmland Industries Inc.—Coffeyville | 59,600 | [1]25,000 | [2]16,000 |
| Phillipsburg | 26,400 | | [2]5,300 |
| National Cooperative Refinery Association—McPherson | 70,900 | [1]20,000 | [2]15,000 |
| Texaco Refining & Marketing Inc.—El Dorado | 80,000 | [1]31,500 | [2]25,500 |
| Total Petroleum Inc.—Arkansas City | 56,000 | [1]19,500 | [2]18,000 |
| **Total** | **353,225** | **129,500** | **100,800** |
| Solvent extraction: [1]5,500 b/sd. † Includes $C_5$-$C_6$ Isom. feed. | | | |
| **Kentucky** | | | |
| Ashland Petroleum Co.—Catlettsburg | 213,400 | [1]60,000<br>§[1]40,000 | [1]18,000<br>[3]27,000 |
| Somerset Refinery Inc.—Somerset | 5,500 | | [2]1,000 |
| **Total** | **218,900** | **100,000** | **46,000** |
| §Reduced crude converter | | | |
| **Louisiana** | | | |
| American International Refinery, Inc.—Lake Charles | *28,500 | | |
| Atlas Processing Co., Division of Pennzoil—Shreveport | 46,200 | | [2]5,000 |
| BP Oil Co.—Belle Chasse | *218,500 | [1]89,000 | [3]37,400 |
| Calcasieu Refining Co.—Lake Charles | 13,500 | | |
| Calumet Lubricants Co.—Princeton | 4,376 | | |
| Canal Refining Co.—Church Point | 9,865 | | [1]1,900 |
| CAS Refining Inc.—Mermentau | 15,000 | | |
| Citgo Petroleum Corp.—Lake Charles | 320,000 | [1]150,000 | [2]52,000<br>[4]54,000 |
| Conoco Inc.—Lake Charles | 159,500 | [1]42,500 | [1]16,000<br>[3]12,000 |
| Exxon Co.—Baton Rouge[1] | 421,000 | [1]188,000 | [4]90,000 |
| Kerr-McGee Refining Corp.—Cotton Valley | 7,800 | ...... | ...... |
| Marathon Oil Co.—Garyville[4] | 225,000 | [1]88,000 | [5]45,000 |
| Mobil Oil Corp.—Chalmette | 160,000 | [1]58,000 | [2]28,000<br>[4]19,000 |
| Murphy Oil USA Inc.—Meraux[2] | 97,000 | [1]35,000 | [6]23,000 |
| Phibro Refining Inc.—Krotz Springs | 56,700 | [1]28,000 | [2]12,000 |
| St. Rose | 28,300 | ...... | ...... |
| Placid Refining Co.—Port Allen[3] | 48,000 | [1]19,000 | [2]10,000 |
| Shell Oil Co.—Norco | 215,000 | ...... | [2]16,000<br>[3,4]38,000 |
| Star Enterprise—Convent | 225,000 | [1]85,000 | [2]40,000 |
| **Total** | **2,299,241** | **782,500** | **499,300** |
| Solvent extraction: [1]6,900 b/sd. [2]15,000 b/sd. [3]5,000 b/sd. [4]30,000 b/sd. | | | |
| **Michigan** | | | |
| Crystal Refining Co.—Carson City | 4,000 | ...... | ...... |
| Lakeside Refining Co.—Kalamazoo | 5,600 | ...... | [1]1,000 |
| Marathon Oil Co.—Detroit | 70,000 | [1]27,000 | [2]18,500 |
| Total Petroleum Inc.—Alma | 45,600 | [1]19,500 | [2]14,000 |
| **Total** | **125,200** | **46,500** | **33,500** |
| **Minnesota** | | | |
| Ashland Petroleum Co.—St. Paul Park | 67,100 | [1]23,000 | [2]23,500 |
| Koch Refining Co.—Rosemount | *218,500 | [1]55,000 | [2]6,000<br>[6]26,000 |
| **Total** | **285,600** | **78,000** | **55,500** |
| **Mississippi** | | | |
| Amerada-Hess Corp.—Purvis | 30,000 | [2]16,000 | [2]5,800 |
| Chevron U.S.A. Inc.—Pascagoula | 295,000 | [1]66,000 | [2]90,000 |
| Ergon Refining Inc.—Vicksburg | 16,800 | ...... | ...... |
| Southland Oil Co.—Lumberton | 5,800 | ...... | ...... |
| Sandersville | 11,000 | ...... | ...... |
| **Total** | **356,600** | **82,000** | **95,800** |
| **Montana** | | | |
| Cenex—Laurel[1] | 40,400 | [1]12,000 | [2]12,000 |
| Conoco Inc.—Billings[2] | 49,500 | [1]19,000 | [2]14,700 |
| Exxon Co.—Billings | 42,000 | [1]21,000 | [1]10,000 |
| Montana Refining Co.—Great Falls | 7,000 | [2]2,400 | [2]1,000 |
| **Total** | **138,900** | **54,400** | **37,700** |
| Solvent extraction: [1]4,000 b/sd. [2]7,500 b/sd (PDA). | | | |
| **Nevada** | | | |
| Petro Source Refining Partners—Tonopah | **4,500** | ...... | ...... |
| **New Jersey** | | | |
| Amerada Hess Corp.—Port Reading | | [1]50,000 | |
| Chevron U.S.A. Inc.—Perth Amboy | 80,000 | | |
| Coastal Eagle Point Oil Co.—Westville | *109,250 | [1]50,000 | [2]27,000 |
| Exxon Co.—Linden | 130,000 | [1]120,000 | [2]28,000 |
| Mobil Oil Corp.—Paulsboro[1] | 100,000 | [1]36,000 | [2]23,500 |
| Seaview Petroleum Co. L.P.—Thorofare | 80,000 | | |
| **Total** | **499,250** | **256,000** | **78,500** |
| Solvent extraction: [1]9,500 b/sd | | | |
| **New Mexico** | | | |
| Bloomfield Refining Co.—Bloomfield | 16,150 | [1]6,200 | [1]4,000 |
| Giant Industries Inc.—Gallup | 20,000 | [1]7,800 | [1]6,800 |
| Navajo Refining Co.—Artesia | *38,000 | [1]20,000 | [2]8,000 |
| Thriftway Marketing Corp.—Farmington | 2,500 | | [2]500 |
| **Total** | **76,650** | **34,000** | **19,300** |

| Company and refinery location | Crude b/cd | b/sd<br>Catalytic cracking | b/sd<br>Catalytic reforming |
|---|---|---|---|
| **New York** | | | |
| Cibro Petroleum Products Co.—Albany | 39,900 | ...... | ...... |
| **North Dakota** | | | |
| Amoco Oil Co.—Mandan | 58,000 | 26,000 | 12,100 |
| **Total** | **58,000** | **26,000** | **12,100** |
| **Ohio** | | | |
| Ashland Petroleum Co.—Canton | 66,000 | 25,000 | 20,000 |
| BP Oil Co.—Lima | 142,500 | 34,000 | 55,000 |
| Toledo | 120,650 | 55,000 | 23,000<br>19,000 |
| Sun Refining & Maketing Co.—Toledo | 125,000 | 60,000 | 45,600 |
| **Total** | **454,150** | **174,000** | **162,600** |
| Solvent extraction: 9,000 b/sd | | | |
| **Oklahoma** | | | |
| Barrett Refining Corp.—Thomas | 11,000 | ...... | ...... |
| Conoco Inc.—Ponca City | 140,000 | 53,000 | 36,000 |
| Cyril Petrochemical Corp.—Cyril | 12,500 | ...... | ...... |
| Kerr-McGee Refining Corp.—Wynnewood | 43,000 | 20,000 | 12,500 |
| Sinclair Oil Corp.—Tulsa | 50,000 | 18,000 | 12,000 |
| Sun Refining & Marketing Co.—Tulsa | 85,000 | 30,000 | 24,000 |
| Total Petroleum Inc.—Ardmore | 68,000 | 25,000 | 17,000 |
| **Total** | **409,500** | **146,000** | **101,500** |
| Solvent extraction: [1]5,000 b/sd [2]10,000 b/sd | | | |
| **Oregon** | | | |
| Chevron U.S.A. Inc.—Portland | | | |
| **Pennsylvania** | | | |
| BP Oil Co.—Marcus Hook | 171,000 | 50,000 | 50,000 |
| Chevron U.S.A. Inc.—Philadelphia | 175,000 | 62,000 | 34,000 |
| Pennzoil Products Co.—Rouseville | 15,700 | ...... | 5,820 |
| Sun Refining & Marketing Co.—Marcus Hook | 175,000 | 87,000 | 24,000 |
| Philadelphia | 130,000 | 40,000 | 50,000 |
| United Refining Co.—Warren | 64,600 | 22,000 | 16,000 |
| Witco Chemical Co.—Bradford | 10,000 | | 1,800 |
| **Total** | **741,300** | **261,000** | **181,620** |
| Solvent extraction: 730 b/sd | | | |
| **Tennessee** | | | |
| Mapco Petroleum Inc.—Memphis | 75,000 | 38,000 | 14,000 |
| **Total** | **75,000** | **38,000** | **14,000** |
| **Texas** | | | |
| Amoco Oil Co.—Texas City | 433,000 | 200,000 | 160,000 |
| Chevron U.S.A. Inc.—El Paso | 66,000 | 22,000 | 25,000 |
| Port Arthur | 315,300 | 120,000 | 23,000<br>44,100 |
| Citgo—Corpus Christi | 132,500 | 76,500 | 54,000 |
| Coastal Refining & Marketing Inc.—Corpus Christi | 90,250 | 18,500 | 11,000<br>17,500 |
| Crown Central Petroleum Corp.—Houston | 100,000 | 56,000 | 14,000<br>22,000 |
| Diamond Shamrock Corp.—Sunray | 111,000 | 45,000 | 15,000<br>25,000 |
| Three Rivers | 53,000 | 20,000 | 9,000<br>10,000 |
| El Paso Refining Co. Ltd.—El Paso | 52,250 | 28,000 | 7,200 |
| Exxon Co. U.S.A.—Baytown | 396,000 | 180,000 | 60,000<br>63,000 |
| Fina Oil & Chemical Co.—Big Spring | 55,000 | 22,000 | 20,000 |
| Port Arthur | 110,000 | 36,000 | 34,000 |
| Howell Hydrocarbons Inc.—San Antonio | 1,900 | | |
| Koch Refining Co.—Corpus Christi | 125,000 | 40,000 | 15,000<br>33,500 |
| LaGloria Oil & Gas Co.—Tyler | 49,500 | 17,000 | 4,000<br>11,700 |
| Leal Petroleum Corp.—Nixon | 12,000 | ...... | ...... |
| Liquid Energy Corp.—Bridgeport | 10,000 | ...... | ...... |
| Lyondell Petrochemical Co.—Houston | 265,000 | 90,000 | 110,000 |
| Marathon Oil Co.—Texas City | 70,000 | 34,000 | 10,500 |
| Mobil Oil Corp.—Beaumont | 275,000 | 102,000 | 57,000<br>46,000 |
| Phibro Refining Inc.—Houston | 67,000 | 61,000 | 13,500 |
| Texas City | 123,500 | 50,000 | 11,000<br>12,000 |
| Phillips 66 Co.—Borger | 105,000 | 60,000 | 26,000 |
| Sweeny | 175,000 | 87,000 | 36,000 |
| Pride Refining Inc.—Abilene | 45,500 | ...... | 6,000 |
| Shell Oil Co.—Deer Park | 215,900 | 65,000 | 20,000<br>43,000 |
| Odessa | 28,600 | 10,500 | 10,000 |
| Southwestern Refining Co., Inc.—Corpus Christi | 104,000 | 50,000 | 30,000 |
| Star Enterprise—Port Arthur | 250,000 | 131,000 | 50,000 |
| Trifinery—Corpus Christi | 18,000 | ...... | ...... |
| Valero Refining Co.—Corpus Christi | 27,000 | †65,000 | 27,000 |
| **Total** | **3,882,200** | **1,686,500** | **1,186,000** |
| Solvent extraction: [1]15,000 b/sd. [2]7,000 b/sd. [3]53,000 b/sd. [4]10,000 b/sd. [5]18,000 b/sd. [6]17,000 b/sd. [7]6,000 b/sd.<br>†Heavy oil cracker. | | | |
| **Utah** | | | |
| Amoco Oil Co.—Salt Lake City | 40,000 | 18,000 | 7,600 |
| Big West Oil Co.—Salt Lake City | 24,000 | 5,000 | 5,000 |
| Chevron U.S.A.—Salt Lake City | 45,000 | 11,000<br>7,000 | 7,500 |
| Crysen Refining Inc.—Woods Cross | 12,500 | ...... | 3,000 |
| Pennzoil Products Co.—Roosevelt | 8,000 | 6,000 | 2,000 |
| Phillips 66 Co.—Woods Cross | 25,000 | 8,400 | 6,000 |
| **Total** | **154,500** | **55,400** | **31,100** |
| Solvent extraction: 5,000 b/sd | | | |
| **Virginia** | | | |
| Amoco Oil Co.—Yorktown | 53,000 | 27,500 | 10,200 |
| **Total** | **53,000** | **27,500** | **10,200** |
| **Washington** | | | |
| Atlantic Richfield Co.—Ferndale | 167,000 | ...... | 56,000 |
| BP Oil Co.—Ferndale | 90,250 | 28,500 | 16,500 |
| Chevron U.S.A. Inc.—Seattle | | | |
| Shell Oil Co.—Anacortes | 89,300 | 42,000 | 26,000 |
| Sound Refining Inc.—Tacoma | 11,900 | | |
| Texaco Refining & Marketing Inc.—Anacortes | 132,000 | 51,000 | 30,000 |
| U.S. Oil & Refining Co.—Tacoma | 32,775 | | 6,000 |
| **Total** | **523,225** | **121,500** | **134,500** |
| Solvent extraction: 4,500 b/sd | | | |
| **West Virginia** | | | |
| Phoenix Refining Co.—St. Mary's | 19,180 | | 1,500 |
| Quaker State Oil Refining Corp.—Newell | 10,500 | ...... | 3,400 |
| **Total** | **29,680** | ...... | **4,900** |
| Solvent extraction: 1,000 b/sd | | | |
| **Wisconsin** | | | |
| Murphy Oil USA Inc.—Superior | 32,000 | 11,000 | 8,000 |
| **Wyoming** | | | |
| Frontier Oil & Refining Co.—Cheyenne | 35,000 | 12,000 | 6,600 |
| Little America Refining Co.—Casper | 22,000 | 14,000 | 6,000 |
| Sinclair Oil Corp.—Sinclair | 54,000 | 21,000 | 14,500 |
| Wyoming Refining Co.—Newcastle | 11,900 | 5,500 | 2,750 |
| **Total** | **122,900** | **52,500** | **29,850** |



*Unit head, with new cyclones is replaced during revamp of the fluid catalytic cracking unit at Chevron U.S.A. Inc.'s 324,500 b/sd refinery at Port Arthur, Tex. (Photo courtesy Stone & Webster).*

# UNITED STATES

## Survey of operating refineries in the U.S. (state capacities as of January 1, 1992)

| | | | b/sd | |
|---|---|---|---|---|
| State | No. plants | Crude capacity b/cd | Cat cracking Fresh feed | Cat reforming |
| Alabama | 4 | 154,250 | | 32,500 |
| Alaska | 5 | 224,500 | | 12,000 |
| Arizona | 2 | 14,210 | | |
| Arkansas | 3 | 60,470 | 18,500 | 9,000 |
| California | 30 | 2,150,555 | 660,000 | 547,600 |
| Colorado | 3 | 91,200 | 27,500 | 22,900 |
| Delaware | 1 | 140,000 | 67,000 | 52,000 |
| Georgia | 2 | 35,500 | | |
| Hawaii | 2 | 143,050 | 20,000 | 13,000 |
| Illinois | 7 | 948,500 | 377,000 | 302,300 |
| Indiana | 4 | 428,900 | 172,000 | 104,500 |
| Kansas | 8 | 353,225 | 129,500 | 100,800 |
| Kentucky | 2 | 218,900 | 100,000 | 46,000 |
| Louisiana | 19 | 2,299,241 | 782,500 | 499,300 |
| Michigan | 4 | 125,200 | 46,500 | 33,500 |
| Minnesota | 2 | 285,600 | 78,000 | 55,500 |
| Mississippi | 5 | 358,600 | 82,000 | 95,800 |
| Montana | 4 | 138,900 | 54,400 | 37,700 |
| Nevada | 1 | 4,500 | | |
| New Jersey | 6 | 499,250 | 256,000 | 78,500 |
| New Mexico | 4 | 76,650 | 34,000 | 19,300 |
| New York | 1 | 39,900 | | |
| North Dakota | 1 | 58,000 | 26,000 | 12,100 |
| Ohio | 4 | 454,150 | 174,000 | 162,600 |
| Oklahoma | 7 | 409,500 | 146,000 | 101,500 |
| Oregon | 1 | | | |
| Pennsylvania | 7 | 741,300 | 261,000 | 181,620 |
| Tennessee | 1 | 75,000 | 38,000 | 14,000 |
| Texas | 31 | 3,882,200 | 1,686,500 | 1,186,000 |
| Utah | 6 | 154,500 | 55,400 | 31,100 |
| Virginia | 1 | 53,000 | 27,500 | 10,200 |
| Washington | 7 | 523,225 | 121,500 | 134,500 |
| West Virginia | 2 | 29,680 | | 4,900 |
| Wisconsin | 1 | 32,000 | 11,000 | 8,000 |
| Wyoming | 4 | 122,900 | 52,500 | 29,850 |
| **Total** | **192** | **15,326,556** | **5,504,300** | **3,938,570** |

# Worldwide production statistics

## NORTH AMERICA

Upper figures = 1,000 b/d
Lower figures = million t/y

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Canada | 23.5<br>1.2 | 79.6<br>4.0 | 525.6<br>26.2 | 1,263.6<br>62.9 | 1,412.0<br>70.3 | 1,396.0<br>69.5 | 1,430.0<br>71.2 | 1,453.0<br>72.4 | 1,475.3<br>73.5 | 1,508.3<br>75.1 | 1,604.6<br>79.9 | 1,588.0<br>79.1 | 1,508.0<br>75.1 | 1,523.3<br>75.9 |
| U.S. | 3,707.4<br>184.6 | 5,407.1<br>269.3 | 7,054.6<br>351.3 | 9,630.0<br>479.6 | 8,569.0<br>426.7 | 8,669.0<br>431.7 | 8,750.0<br>435.8 | 8,919.0<br>444.2 | 8,790.0<br>437.7 | 8,276.7<br>412.2 | 8,165.9<br>406.7 | 7,675.6<br>382.2 | 7,220.0<br>359.6 | 7,371.4<br>367.1 |
| Total | 3,730.9<br>185.8 | 5,486.7<br>273.3 | 7,580.2<br>377.5 | 10,893.6<br>542.5 | 9,981.0<br>497.0 | 10,065.0<br>501.2 | 10,180.0<br>507.0 | 10,372.0<br>516.6 | 10,265.3<br>511.2 | 9,785.0<br>487.3 | 9,770.5<br>486.6 | 9,263.6<br>461.3 | 8,728.0<br>434.7 | 8,894.7<br>443.0 |

## MIDDLE EAST

Upper figures = 1,000 b/d
Lower figures = million t/y

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Abu Dhabi | ...<br>... | ...<br>... | ...<br>... | 693.8<br>34.6 | 1,350.0<br>67.2 | 757.0<br>37.7 | 750.0<br>37.4 | 705.1<br>35.1 | 949.0<br>47.3 | 969.4<br>48.3 | 1,012.6<br>50.4 | 1,359.0<br>67.7 | 1,587.0<br>79.0 | 1,945.8<br>96.9 |
| Bahrain | 19.3<br>1.0 | 30.2<br>1.5 | 45.1<br>2.2 | 76.6<br>3.8 | 48.0<br>2.4 | 41.0<br>2.0 | 41.0<br>2.0 | 41.9<br>2.1 | 44.0<br>2.2 | 43.2<br>2.2 | 42.3<br>2.1 | 42.2<br>2.1 | 42.0<br>2.1 | 38.2<br>1.9 |
| Dubai | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 349.0<br>17.4 | 327.0<br>16.3 | 324.0<br>16.1 | 348.0<br>17.3 | 350.0<br>17.4 | 381.2<br>19.0 | 355.3<br>17.7 | 410.6<br>20.4 | 469.0<br>23.4 | 434.0<br>21.6 |
| Iran | 181.2<br>9.0 | 664.3<br>33.1 | 1,067.6<br>53.2 | 3,328.8<br>165.8 | 1,467.0<br>73.1 | 2,608.0<br>129.9 | 2,165.0<br>107.9 | 2,279.0<br>113.5 | 1,806.3<br>90.0 | 2,343.7<br>116.6 | 2,107.6<br>105.0 | 2,934.3<br>146.1 | 3,120.0<br>155.4 | 3,342.0<br>166.4 |
| Iraq | 60.7<br>3.0 | 136.2<br>6.8 | 1,004.2<br>50.0 | 1,548.6<br>77.1 | 2,638.0<br>131.4 | 905.0<br>45.1 | 1,218.0<br>60.7 | 1,396.8<br>69.6 | 1,787.7<br>89.0 | 2,095.8<br>104.4 | 2,679.2<br>133.4 | 2,830.0<br>140.9 | 2,083.0<br>103.7 | 280.0<br>13.9 |
| Israel | ...<br>... | ...<br>... | 2.5<br>0.1 | 70.2<br>3.5 | 1.0<br>... | 0.2<br>... | 0.1<br>... | 0.1<br>... | 0.1<br>... | 1.0<br>... | 0.3<br>... | 0.3<br>... | 0.3<br>... | 0.2<br>... |
| Jordan | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 4.0<br>0.2 | 0.5<br>... | 0.3<br>... | 0.4<br>... | 0.3<br>... |
| Kuwait | ...<br>... | 344.4<br>17.2 | 1,628.2<br>81.1 | 2,734.5<br>136.2 | 1,382.0<br>68.8 | 912.0<br>45.4 | 926.0<br>46.1 | 823.3<br>41.0 | 1,202.0<br>59.9 | 1,095.8<br>54.6 | 1,254.2<br>62.5 | 1,542.6<br>76.8 | 1,080.0<br>53.8 | 126.3<br>6.3 |
| Neutral Zone | ...<br>... | ...<br>... | 136.2<br>6.8 | 500.6<br>24.9 | 540.0<br>26.9 | 398.0<br>19.8 | 420.0<br>20.9 | 357.8<br>17.8 | 325.7<br>16.2 | 399.2<br>19.9 | 316.3<br>15.8 | 396.6<br>19.8 | 315.0<br>15.7 | 129.7<br>6.5 |
| Oman | ...<br>... | ...<br>... | ...<br>... | 332.4<br>16.6 | 283.0<br>14.1 | 378.0<br>18.8 | 404.0<br>20.1 | 484.3<br>24.1 | 540.8<br>26.9 | 565.0<br>28.1 | 556.7<br>27.7 | 627.7<br>31.3 | 658.0<br>32.8 | 705.0<br>35.1 |
| Qatar | ...<br>... | 33.6<br>1.7 | 175.1<br>8.7 | 362.4<br>18.0 | 472.0<br>23.5 | 270.0<br>13.4 | 395.0<br>19.7 | 297.0<br>14.8 | 332.3<br>16.5 | 284.4<br>14.2 | 349.2<br>17.4 | 394.6<br>19.7 | 387.0<br>19.3 | 390.0<br>19.4 |
| Ras Al Khaimah | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 6.0<br>0.3 | 9.1<br>0.5 | 11.0<br>0.5 | 12.0<br>0.6 | 10.0<br>0.5 | 10.0<br>0.5 | 10.0<br>0.5 | 0.8<br>... |
| Saudi Arabia | 13.9<br>0.7 | 546.7<br>27.2 | 1,247.1<br>62.1 | 3,548.9<br>176.7 | 9,630.0<br>479.6 | 4,872.0<br>242.6 | 4,545.0<br>226.3 | 3,295.3<br>164.1 | 4,719.7<br>235.0 | 4,054.2<br>201.9 | 4,708.3<br>234.5 | 4,935.6<br>245.8 | 6,215.0<br>309.5 | 8,157.7<br>406.3 |
| Sharjah | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 10.0<br>0.5 | 35.0<br>1.7 | 62.0<br>3.1 | 66.1<br>3.3 | 60.0<br>3.0 | 66.0<br>3.3 | 60.0<br>3.0 | 45.0<br>2.2 | 45.0<br>2.2 | 34.7<br>1.7 |
| Syria | ...<br>... | ...<br>... | ...<br>... | 83.1<br>4.1 | 165.0<br>8.2 | 165.0<br>8.2 | 161.0<br>8.0 | 161.7<br>8.1 | 185.0<br>9.2 | 231.7<br>11.5 | 273.3<br>13.6 | 300.6<br>15.0 | 385.0<br>19.2 | 473.0<br>23.6 |
| Yemen | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 10.0<br>0.5 | 180.0<br>9.0 | 175.4<br>8.7 | 185.4<br>9.2 | 179.0<br>8.9 | 200.0<br>10.0 |
| Total | 275.1<br>13.7 | 1,755.4<br>87.5 | 5,306.0<br>264.2 | 13,278.8<br>661.3 | 18,335.0<br>913.1 | 11,668.2<br>580.8 | 11,416.9<br>568.6 | 10,266.5<br>511.3 | 12,320.6<br>613.6 | 12,553.5<br>625.2 | 14,043.1<br>699.3 | 15,831.6<br>788.3 | 16,565.7<br>825.0 | 16,248.5<br>809.1 |

## WESTERN EUROPE

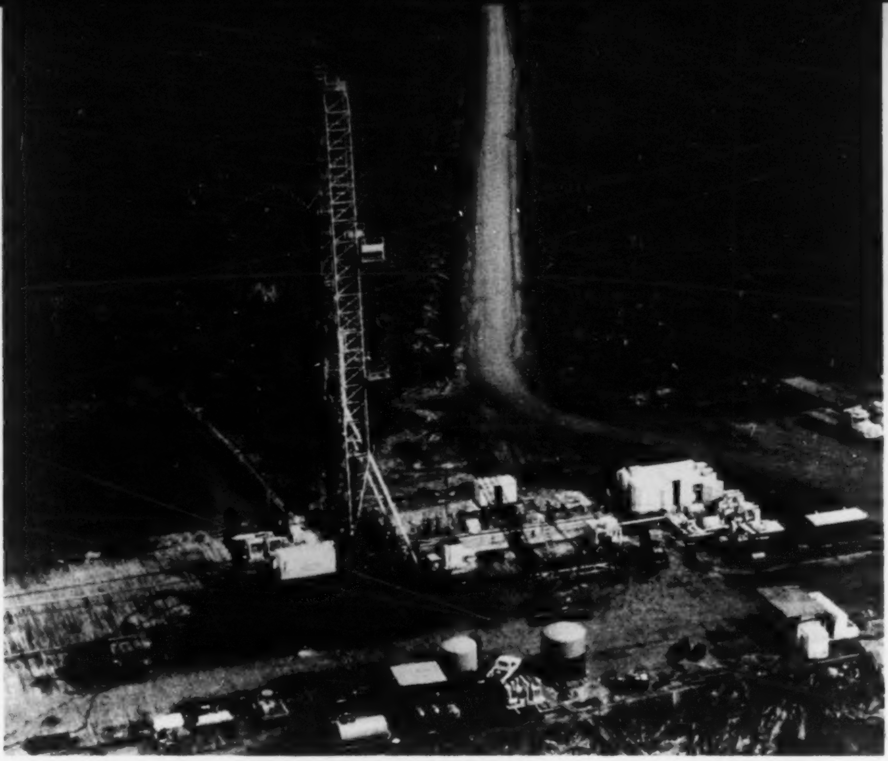
Upper figures = 1,000 b/d
Lower figures = million t/y

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Austria | 7.7<br>0.4 | 27.9<br>1.4 | 45.4<br>2.3 | 53.3<br>2.7 | 29.0<br>1.4 | 24.0<br>1.2 | 23.0<br>1.1 | 21.7<br>1.1 | 22.2<br>1.1 | 21.6<br>1.1 | 23.2<br>1.2 | 23.3<br>1.2 | 24.0<br>1.2 | 25.9<br>1.3 |
| Denmark | ...<br>... | ...<br>... | ...<br>... | ...<br>... | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible]<br>4.7 | [illegible] | [illegible] | [illegible] | [illegible] |
| France | 1.4<br>0.1 | 2.5<br>0.1 | 38.6<br>1.9 | 45.8<br>2.3 | 26.0<br>1.3 | 32.0<br>1.6 | 35.0<br>1.7 | 49.0<br>2.4 | 59.0<br>2.9 | 63.5<br>3.2 | 68.7<br>3.4 | 65.3<br>3.3 | 62.0<br>3.1 | 58.5<br>2.9 |
| Germany | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Greece | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 25.0<br>1.2 | 27.0<br>1.3 | 26.4<br>1.3 | 26.4<br>1.3 | 24.4<br>1.2 | 21.8<br>1.1 | 17.0<br>0.8 | 15.0<br>0.7 | 15.3<br>0.8 |
| Italy | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Netherlands | ...<br>... | 13.4<br>0.7 | 36.0<br>1.8 | 35.8<br>1.8 | 25.0<br>1.2 | 42.0<br>2.1 | 61.0<br>3.0 | 69.0<br>3.4 | 79.0<br>3.9 | 91.3<br>4.5 | 83.7<br>4.2 | 87.0<br>4.3 | 71.0<br>3.5 | 66.3<br>3.3 |
| Norway | ...<br>... | ...<br>... | ...<br>... | ...<br>... | [illegible]<br>26.3 | [illegible] | [illegible] | 771.0<br>38.4 | [illegible] | 973.3<br>48.6 | [illegible] | [illegible] | 1,574.0<br>[illegible] | [illegible] |
| Spain | ...<br>... | ...<br>... | ...<br>... | 3.1<br>0.2 | 32.0<br>1.6 | 59.0<br>2.9 | 45.0<br>2.2 | 45.3<br>2.3 | 37.2<br>1.9 | 32.8<br>1.6 | 30.4<br>1.5 | 18.0<br>0.9 | 14.3<br>0.7 | 21.3<br>1.1 |
| Turkey | ...<br>... | 0.3<br>... | 7.0<br>0.3 | 67.9<br>3.4 | 44.0<br>2.2 | 45.0<br>2.2 | 41.5<br>2.0 | 41.5<br>2.1 | [illegible]<br>2.3 | 52.0<br>2.6 | [illegible]<br>2.5 | 56.5<br>2.8 | 70.0<br>3.5 | 85.7<br>4.3 |
| United Kingdom | 0.3<br>... | 0.9<br>... | 1.7<br>0.1 | 1.7<br>0.1 | 1,619.0<br>80.6 | 2,260.0<br>112.5 | 2,452.0<br>122.1 | 2,519.8<br>125.5 | 2,602.0<br>129.6 | 2,445.9<br>121.8 | 2,376.3<br>118.3 | 1,743.0<br>86.8 | 1,860.0<br>92.6 | 1,779.3<br>88.6 |
| Total | 29.7<br>1.5 | 68.4<br>3.4 | [illegible]<br>13.7 | [illegible]<br>19.2 | [illegible]<br>121.8 | [illegible]<br>162.2 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

## AFRICA

Upper figures = 1,000 b/d
Lower figures = million t/y

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Algeria | ...<br>... | ...<br>... | 182.7<br>9.1 | 1,029.1<br>51.2 | 1,016.0<br>50.6 | 686.6<br>34.2 | 608.0<br>30.3 | 643.3<br>32.0 | 600.7<br>29.9 | 647.9<br>32.3 | 666.8<br>33.2 | 698.0<br>34.8 | 797.0<br>39.7 | 798.0<br>39.7 |
| Angola (inc. Cabinda) | ...<br>... | ...<br>... | 1.3<br>0.1 | 13.7<br>0.7 | [illegible]<br>7.5 | 174.0<br>8.7 | 207.0<br>10.3 | 228.5<br>11.4 | [illegible]<br>14.0 | 341.3<br>17.0 | [illegible]<br>22.4 | 454.7<br>22.6 | 480.0<br>23.9 | [illegible]<br>24.6 |
| Cameroon | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 58.0<br>2.9 | 114.0<br>5.7 | 125.0<br>6.2 | 133.5<br>6.6 | 180.0<br>9.0 | 170.0<br>8.5 | 170.0<br>8.5 | 172.7<br>8.6 | 164.0<br>8.2 | 151.5<br>7.5 |
| Congo | ...<br>... | ...<br>... | ...<br>... | ...<br>... | [illegible]<br>2.8 | 95.0<br>4.7 | 118.0<br>5.9 | 115.1<br>5.7 | 115.0<br>5.7 | 118.0<br>5.9 | 134.6<br>6.7 | 150.0<br>[illegible] | 161.0<br>8.0 | 156.5<br>7.7 |
| Egypt | 18.1<br>0.9 | 44.9<br>2.2 | 61.6<br>3.1 | 327.3<br>16.3 | 596.0<br>29.7 | 690.0<br>34.4 | 790.0<br>39.3 | 885.8<br>44.1 | 773.7<br>38.5 | 899.3<br>44.8 | 851.3<br>42.4 | 854.3<br>42.5 | 873.0<br>43.5 | 885.0<br>44.1 |
| Gabon | ...<br>... | ...<br>... | 16.1<br>0.8 | [illegible]<br>5.4 | [illegible]<br>9.0 | [illegible] | [illegible]<br>7.5 | [illegible]<br>7.5 | 146.2<br>7.3 | [illegible] | [illegible]<br>8.7 | 197.3<br>9.8 | [illegible]<br>13.4 | 294.7<br>14.7 |
| Ivory Coast | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 24.0<br>1.2 | 22.0<br>1.1 | 28.0<br>1.4 | 20.0<br>1.0 | 16.0<br>0.8 | 12.9<br>0.6 | 2.0<br>0.1 | 2.1<br>0.1 | 2.0<br>0.1 |
| Libya | ...<br>... | ...<br>... | ...<br>... | 3,318.0<br>165.2 | [illegible]<br>88.9 | [illegible] | 1,090.0<br>[illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible]<br>74.7 |
| Nigeria | ...<br>... | ...<br>... | 17.3<br>0.9 | 1,083.3<br>53.9 | 2,057.0<br>102.4 | 1,232.0<br>61.4 | 1,414.0<br>70.4 | 1,445.5<br>72.0 | 1,464.0<br>72.9 | 1,238.6<br>61.7 | 1,358.3<br>67.6 | 1,605.3<br>79.9 | 1,808.0<br>90.0 | 1,857.3<br>92.5 |
| Tunisia | ...<br>... | ...<br>... | [illegible] | 87.7<br>4.4 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible]<br>4.6 | [illegible] |
| Zaire | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 20.0<br>1.0 | 26.0<br>1.3 | 27.0<br>1.3 | 30.5<br>1.5 | 32.1<br>1.6 | 31.8<br>1.6 | 29.5<br>1.5 | 27.5<br>1.4 | 28.0<br>1.4 | 28.4<br>1.4 |
| Others | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Total | 18.1<br>0.9 | 45.7<br>2.2 | [illegible]<br>14.2 | [illegible] | [illegible] | 4,333.2<br>[illegible] | 4,672.7<br>232.7 | [illegible] | [illegible] | [illegible] | [illegible]<br>247.3 | [illegible] | [illegible]<br>301.2 | 6,275.4<br>312.4 |



*New discoveries of oil and gas are sought by Indonesia's Pertamina and its partners in remote regions. (Photo courtesy OPEC Bulletin.)*

## ASIA-PACIFIC

Upper figures = 1,000 b/d
Lower figures = million t/y

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | ...<br>— | ...<br>— | ...<br>— | 175.6<br>8.7 | 379.0<br>18.9 | 405.0<br>20.2 | 481.0<br>24.0 | 556.0<br>27.7 | 472.0<br>23.5 | 566.1<br>28.2 | 552.3<br>27.5 | 488.8<br>24.3 | 582.0<br>29.0 | 543.0<br>27.0 |
| Bangladesh | ...<br>— | ...<br>— | ...<br>— | ...<br>— | ...<br>— | ...<br>— | ...<br>— | ...<br>— | ...<br>— | 0.5<br>— | 0.9<br>— | 0.9<br>— | 0.9<br>— | 0.8<br>— |
| Brunei | 19.3<br>1.0 | 84.8<br>4.2 | 92.9<br>4.6 | 148.0<br>7.4 | 230.0<br>11.5 | 155.0<br>7.7 | 160.0<br>8.0 | 149.5<br>7.4 | 170.0<br>8.5 | 133.7<br>6.7 | 138.3<br>6.9 | 143.3<br>7.1 | 143.0<br>7.1 | 151.3<br>7.5 |
| China | ... | 4.0<br>0.2 | 100.0<br>5.0 | 600.0<br>29.9 | 2,119.0<br>105.5 | 2,120.0<br>105.6 | 2,250.0<br>112.1 | 2,496.0<br>124.3 | 2,620.0<br>130.5 | 2,700.0<br>134.6 | 2,733.0<br>136.1 | 2,770.0<br>137.9 | 2,755.0<br>137.2 | 2,800.0<br>139.4 |
| China, Taiwan | ...<br>... | ...<br>... | 0.4<br>... | 1.8<br>0.1 | 5.0<br>0.2 | 2.3<br>0.1 | 2.6<br>0.1 | 2.7<br>0.1 | 1.9<br>0.1 | 2.6<br>0.1 | 2.6<br>0.1 | 2.6<br>0.1 | 2.5<br>0.1 | 1.9<br>0.1 |
| India | 3.9<br>0.2 | 5.1<br>0.3 | 9.0<br>0.4 | 138.6<br>6.9 | 182.0<br>9.1 | 390.0<br>19.4 | 543.0<br>27.0 | 614.[illegible]<br>30.6 | 622.7<br>31.0 | 608.7<br>30.3 | 631.8<br>31.5 | 673.3<br>33.5 | 675.0<br>33.6 | 647.0<br>32.2 |
| Indonesia | 169.4<br>8.4 | 132.6<br>6.6 | 411.2<br>2.05 | 853.6<br>42.5 | 1,576.0<br>78.5 | 1,292.0<br>64.3 | 1,332.0<br>66.3 | 1,219.5<br>60.7 | 1,243.8<br>61.9 | 1,185.8<br>59.1 | 1,137.5<br>56.6 | 1,208.6<br>60.2 | 1,274.0<br>63.4 | 1,432.6<br>71.3 |
| Japan | 7.2<br>0.4 | 5.6<br>0.3 | 10.2<br>0.5 | 15.3<br>0.8 | 10.6<br>0.5 | 6.9<br>0.3 | 6.4<br>0.3 | 10.0<br>0.5 | 11.8<br>0.6 | 12.1<br>0.6 | 12.3<br>0.6 | 11.3<br>0.6 | 10.5<br>0.5 | 14.0<br>0.7 |
| Malaysia | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 288.0<br>14.3 | 370.0<br>18.4 | 462.0<br>23.0 | 432.8<br>21.6 | 503.3<br>25.1 | 467.4<br>23.3 | 540.0<br>26.9 | 557.3<br>27.8 | 605.0<br>30.1 | 629.0<br>31.3 |
| Myanmar (Burma) | 21.1<br>1.1 | 1.6<br>0.1 | 11.1<br>0.6 | 16.4<br>0.8 | 30.0<br>1.5 | 30.0<br>1.4 | 30.0<br>1.5 | 30.0<br>1.5 | 30.0<br>1.6 | 24.0<br>1.2 | 15.0<br>0.7 | 12.0<br>0.6 | 13.0<br>0.6 | 12.0<br>0.6 |
| New Zealand | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 7.0<br>0.3 | 15.0<br>0.7 | 18.0<br>0.9 | 18.0<br>0.9 | 29.3<br>1.5 | 28.3<br>1.4 | 28.0<br>1.4 | 28.0<br>1.4 | 39.0<br>1.9 | 40.0<br>2.0 |
| Pakistan | 2.4<br>0.1 | 3.6<br>0.2 | 7.2<br>0.4 | 9.9<br>0.5 | 10.0<br>0.5 | 13.0<br>0.6 | 18.0<br>0.9 | 34.5<br>1.7 | 41.0<br>2.0 | 41.6<br>2.1 | 47.0<br>2.3 | 45.0<br>2.2 | 60.0<br>3.0 | 69.5<br>3.5 |
| Papua New Guinea | ...<br>... | 4.8<br>0.2 | 4.2<br>0.2 | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... |
| Philippines | ...<br>— | ...<br>— | ...<br>— | ...<br>— | 15.0<br>0.7 | 15.0<br>0.8 | 12.0<br>0.6 | 9.3<br>0.5 | 6.5<br>0.3 | 6.1<br>0.3 | 9.2<br>0.5 | 4.5<br>0.2 | 5.6<br>0.3 | 3.0<br>0.1 |
| Thailand | ...<br>... | ...<br>... | ...<br>... | 0.4<br>... | ...<br>... | 11.0<br>0.5 | 19.0<br>0.9 | 34.3<br>1.7 | 35.6<br>1.8 | 31.3<br>1.6 | 38.4<br>1.9 | 39.0<br>1.9 | 41.0<br>2.0 | 46.6<br>2.3 |
| Viet Nam* | ...<br>— | ...<br>— | ...<br>— | ...<br>— | ...<br>— | ...<br>— | ...<br>— | ...<br>— | ...<br>— | ...<br>— | ...<br>— | ...<br>— | 40.0<br>2.0 | 65.0<br>3.3 |
| Total | 223.3<br>11.2 | 241.8<br>12.1 | 646.2<br>32.2 | 1,860.6<br>92.6 | 4,881.0<br>241.5 | 4,825.2<br>240.0 | 5,334.0<br>265.6 | 5,606.4<br>279.2 | 5,788.7<br>288.3 | 5,807.2<br>289.4 | 5,888.3<br>293.0 | 5,984.1<br>297.8 | 6,240.0<br>310.8 | 6,458.6<br>321.3 |

*Prior to 1990, included in other Eastern Europe - U.S.S.R.

## LATIN AMERICA

Upper figures = 1,000 b/d
Lower figures = million t/y

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Argentina | 56.3<br>2.8 | 64.0<br>3.2 | 171.9<br>8.6 | 382.9<br>19.1 | 487.0<br>24.3 | 481.0<br>24.0 | 467.0<br>23.3 | 447.5<br>22.3 | 430.2<br>21.4 | 419.1<br>20.9 | 449.6<br>22.4 | 459.0<br>22.9 | 473.0<br>23.6 | 487.3<br>24.3 |
| Bolivia | 0.8<br>... | 1.7<br>0.1 | 9.8<br>0.5 | 16.3<br>0.8 | 30.0<br>1.5 | 22.0<br>1.1 | 20.0<br>1.0 | 20.0<br>1.0 | 18.7<br>0.9 | 18.5<br>0.9 | 18.8<br>0.9 | 20.3<br>1.0 | 19.2<br>1.0 | 22.3<br>1.1 |
| Brazil | ...<br>... | 0.9<br>... | 80.9<br>4.0 | 160.5<br>8.0 | 182.0<br>9.1 | 315.0<br>15.7 | 437.0<br>21.8 | 540.5<br>26.9 | 578.0<br>28.8 | 562.8<br>28.0 | 555.6<br>27.7 | 597.1<br>29.7 | 633.0<br>31.5 | 635.8<br>31.7 |
| Chile | ...<br>... | 1.7<br>0.1 | 19.8<br>1.0 | 34.6<br>1.7 | 29.0<br>1.4 | 39.0<br>1.9 | 38.0<br>1.9 | 32.5<br>1.6 | 34.4<br>1.7 | 28.3<br>1.4 | 24.8<br>1.2 | 23.7<br>1.2 | 20.3<br>1.0 | 17.8<br>0.9 |
| Colombia | 69.9<br>3.5 | 93.3<br>4.6 | 152.7<br>7.6 | 214.0<br>10.7 | 125.0<br>6.2 | 155.0<br>7.7 | 165.0<br>8.2 | 178.8<br>8.9 | 324.2<br>16.1 | 387.8<br>19.3 | 346.7<br>17.3 | 405.0<br>20.2 | 445.0<br>22.2 | 439.2<br>21.9 |
| Cuba* | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 15.0<br>0.7 | 15.0<br>0.7 |
| Ecuador | 6.4<br>0.3 | 7.2<br>0.4 | 7.7<br>0.4 | 4.1<br>0.2 | 222.0<br>11.1 | 236.0<br>11.8 | 254.0<br>12.6 | 273.3<br>13.6 | 270.1<br>13.5 | 157.2<br>7.8 | 310.1<br>15.4 | 286.6<br>14.3 | 287.0<br>14.3 | 292.6<br>14.6 |
| Guatemala | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 5.0<br>0.2 | 7.5<br>0.4 | 5.2<br>0.3 | 3.1<br>0.2 | 4.9<br>0.2 | 3.9<br>0.2 | 3.7<br>0.2 | 3.7<br>0.2 | 4.0<br>0.2 | 3.8<br>0.2 |
| Mexico | 120.3<br>6.0 | 198.5<br>9.9 | 270.6<br>13.5 | 430.2<br>21.4 | 1,936.0<br>96.4 | 2,702.0<br>134.6 | 2,743.0<br>136.6 | 2,797.0<br>139.3 | 2,468.0<br>122.9 | 2,537.8<br>126.4 | 2,527.3<br>125.9 | 2,618.0<br>130.4 | 2,633.0<br>131.1 | 2,777.0<br>138.3 |
| Peru | 33.2<br>1.7 | 41.1<br>2.0 | 52.6<br>2.6 | 72.2<br>3.6 | 191.0<br>9.5 | 171.0<br>8.6 | 201.0<br>10.0 | 189.0<br>9.4 | 179.0<br>8.9 | 166.7<br>8.3 | 141.7<br>7.1 | 129.0<br>6.4 | 132.0<br>6.6 | 116.2<br>5.8 |
| Trinidad & Tobogo | 60.9<br>3.0 | 56.5<br>2.8 | 115.7<br>5.8 | 139.8<br>7.0 | 211.0<br>10.5 | 158.0<br>7.9 | 169.0<br>8.4 | 179.0<br>8.9 | 167.9<br>8.4 | 163.1<br>8.1 | 149.3<br>7.4 | 153.7<br>7.7 | 151.0<br>7.5 | 144.9<br>7.2 |
| Venezuela | 507.0<br>25.2 | 1,498.0<br>74.6 | 2,846.1<br>141.7 | 3,708.0<br>184.7 | 2,167.0<br>102.9 | 1,791.0<br>89.2 | 1,724.0<br>85.9 | 1,669.0<br>83.1 | 1,664.9<br>82.9 | 1,591.9<br>79.3 | 1,658.0<br>82.6 | 1,731.6<br>86.2 | 2,118.0<br>105.5 | 2,341.3<br>116.6 |
| Others | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 0.5<br>... | 2.2<br>0.1 | 2.9<br>0.1 | 3.6<br>0.2 | 3.6<br>0.2 | 3.7<br>0.2 | 4.9<br>0.2 | 5.2<br>0.3 | 5.3<br>0.3 |
| Total | 854.8<br>42.5 | 1,882.8<br>97.7 | 3,727.8<br>185.7 | 5,182.8<br>257.2 | 5,585.0<br>278.1 | 6,078.0<br>302.8 | 6,225.4<br>310.1 | 6,332.6<br>315.3 | 6,143.5<br>305.8 | 6,048.7<br>300.8 | 6,188.3<br>308.3 | 6,432.8<br>320.4 | 6,935.7<br>345.5 | 7,298.5<br>363.6 |
| World Total, excl. E. Europe-U.S.S.R. | 5,131.9<br>255.6 | 9,581.0<br>476.2 | 17,818.7<br>887.5 | 37,048.4<br>1,870.0 | 47,232.0<br>2,352.0 | 40,228.6<br>2,002.9 | 41,380.0<br>2,060.5 | 41,149.8<br>2,049.3 | 43,182.8<br>2,150.7 | 42,874.0<br>2,135.6 | 44,854.9<br>2,233.6 | 46,846.8<br>2,332.7 | 48,511.0<br>2,415.6 | 48,395.2<br>2,459.7 |

*Prior to 1990, included in other Eastern Europe - U.S.S.R.

## EASTERN EUROPE — U.S.S.R.

Upper figures = 1,000 b/d
Lower figures = million t/y

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bulgaria | ...<br>... | ...<br>... | 4.0<br>0.2 | 6.7<br>0.3 | 6.0<br>0.3 | 3.0<br>0.1 | 3.0<br>0.1 | 3.0<br>0.1 | 3.0<br>0.1 | 6.0<br>0.3 | 5.0<br>0.2 | 5.0<br>0.2 | 5.0<br>0.2 | 4.0<br>0.2 |
| Czechoslovakia | ...<br>... | 0.8<br>... | 2.7<br>0.1 | 4.1<br>0.2 | 1.9<br>0.1 | 2.0<br>0.1 | 2.0<br>0.1 | 2.0<br>0.1 | 2.0<br>0.1 | 2.0<br>0.1 | 3.0<br>0.1 | 3.0<br>0.1 | 3.0<br>0.1 | 3.0<br>0.1 |
| Hungary | ...<br>... | 10.1<br>0.5 | 24.3<br>1.2 | 38.7<br>1.9 | 40.6<br>2.0 | 40.0<br>2.0 | 40.0<br>2.0 | 40.0<br>2.0 | 40.0<br>2.0 | 40.0<br>2.0 | 40.0<br>2.0 | 39.0<br>1.9 | 40.0<br>2.0 | 39.0<br>1.9 |
| Poland | ...<br>... | 3.3<br>0.2 | 3.5<br>0.2 | 8.5<br>0.4 | 6.6<br>0.3 | 5.0<br>0.2 | 5.0<br>0.3 | 5.0<br>0.2 | 4.0<br>0.2 | 4.0<br>0.2 | 4.0<br>0.2 | 3.0<br>0.1 | 3.0<br>0.1 | 2.0<br>0.1 |
| Romania | ...<br>... | 87.7<br>4.4 | 231.0<br>11.5 | 268.6<br>13.4 | 230.9<br>11.5 | 240.0<br>12.0 | 229.0<br>11.4 | 226.0<br>11.3 | 220.0<br>11.0 | 215.0<br>10.7 | 188.0<br>9.4 | 180.0<br>9.0 | 160.0<br>8.0 | 130.0<br>6.5 |
| U.S.S.R.* | 614.9<br>31.1 | 760.6<br>37.9 | 2,959.1<br>147.9 | 7,050.2<br>353.0 | 12,031.0<br>599.1 | 12,330.0<br>613.5 | 12,265.0<br>610.3 | 11,900.0<br>592.6 | 12,300.0<br>612.5 | 12,480.0<br>621.5 | 12,482.0<br>620.1 | 12,140.0<br>604.6 | 11,560.0<br>572.7 | 10,280.0<br>510.9 |
| Yugoslavia | 0.3<br>... | 2.1<br>0.1 | 18.8<br>0.9 | 57.8<br>2.9 | 84.5<br>4.2 | 82.0<br>4.1 | 80.0<br>4.0 | 81.0<br>4.0 | 83.0<br>4.1 | 84.0<br>4.2 | 73.0<br>3.6 | 70.0<br>3.5 | 65.0<br>3.2 | 56.3<br>2.8 |
| Others | ...<br>... | 2.7<br>0.1 | 14.9<br>0.7 | 37.1<br>1.8 | 50.0<br>2.5 | 86.0<br>4.3 | 96.0<br>4.8 | 86.0<br>4.3 | 77.5<br>2.8 | 80.0<br>4.0 | 84.5<br>4.2 | 85.0<br>4.3 | 30.0<br>1.5 | 30.0<br>1.5 |
| Total | 628.2<br>31.1 | 867.3<br>43.2 | 3,288.7<br>162.7 | 7,510.7<br>373.8 | 12,451.5<br>620.0 | 12,770.0<br>636.3 | 12,715.0<br>633.1 | 12,343.0<br>614.8 | 12,720.0<br>633.8 | 12,911.0<br>643.0 | 12,880.0<br>638.6 | 12,528.0<br>623.7 | 11,808.0<br>587.8 | 10,524.3<br>524.0 |
| *Includes gas liquids | | | | | | | | | | | | | | |
| World Total | 5,757.1<br>288.7 | 10,438.3<br>519.4 | 21,088.4<br>1,050.2 | 45,059.1<br>2,243.8 | 59,683.5<br>2,972.0 | 53,006.6<br>2,639.2 | 54,095.0<br>2,693.6 | 53,492.8<br>2,663.9 | 55,921.8<br>2,784.3 | 55,735.0<br>2,778.6 | 57,704.8<br>2,873.4 | 59,372.8<br>2,956.4 | 60,317.0<br>3,003.4 | 58,919.5<br>2,968.7 |

# Worldwide oil consumption

Upper figures = 1.000 b/d
Lower figures = million t/y

| | 1988 | 1989 | 1990 |
|---|---|---|---|
| U.S. | 16,525<br>793.4 | 16,595<br>794.9 | 16,200<br>778.9 |
| Canada | [illegible] | [illegible] | 1,610<br>[illegible] |
| **Total North America** | 18,115<br>867.1 | 18,255<br>871.6 | 17,815<br>853.7 |
| Latin America | [illegible] | [illegible] | [illegible] |
| **Total Western Hemisphere** | 23,195<br>1,105.0 | 23,530<br>1,121.0 | 23,215<br>1,108.5 |
| Austria | [illegible] | [illegible] | [illegible] |
| Belgium and Luxembourg | 500<br>24.4 | 500<br>24.4 | 495<br>24.1 |
| Denmark | [illegible] | [illegible]<br>9.1 | [illegible] |
| Finland | 230<br>11.0 | 230<br>11.0 | 230<br>10.9 |
| France | [illegible] | [illegible] | [illegible] |
| Germany | 2,750<br>129.7 | 2,595<br>121.8 | 2,690<br>126.2 |
| Greece | [illegible] | [illegible] | [illegible] |
| Ireland | 80<br>3.9 | 85<br>4.0 | 90<br>4.4 |
| Italy | [illegible] | [illegible] | [illegible] |
| Netherlands | 740<br>34.5 | 735<br>33.9 | 745<br>34.2 |
| Norway | [illegible] | [illegible] | [illegible] |
| Portugal | 185<br>8.7 | 230<br>11.3 | 230<br>11.0 |
| Spain | [illegible] | [illegible] | [illegible] |
| Sweden | 340<br>16.3 | 325<br>15.4 | 320<br>15.0 |
| Switzerland | [illegible] | [illegible] | [illegible] |
| Turkey | 465<br>22.3 | 470<br>22.5 | 500<br>23.8 |
| United Kingdom | [illegible] | [illegible] | [illegible] |
| Other | 60<br>3.1 | 65<br>3.2 | 70<br>3.4 |

| | 1988 | 1989 | 1990 |
|---|---|---|---|
| **Total Western Europe** | 12,880<br>610.9 | 12,940<br>613.5 | 13,100<br>620.5 |
| U.S.S.R. | [illegible] | [illegible] | 8,145<br>[illegible] |
| Central Europe | 1,865<br>91.6 | 1,885<br>92.1 | 1,620<br>79.4 |
| Middle East | [illegible] | [illegible] | [illegible] |
| Africa | 1,830<br>87.8 | 1,920<br>91.9 | 1,965<br>93.9 |
| China | [illegible] | [illegible]<br>114.5 | 2,275<br>113.4 |
| Indonesia | 525<br>25.2 | 560<br>26.9 | 640<br>30.9 |
| Japan | [illegible] | [illegible] | [illegible] |
| Malaysia | 190<br>9.0 | 200<br>9.5 | 220<br>10.5 |
| Philippines | [illegible] | [illegible] | [illegible]<br>11.3 |
| Singapore | 315<br>16.5 | 360<br>18.9 | 370<br>19.5 |
| South Korea | [illegible]<br>34.7 | [illegible] | [illegible]<br>48.5 |
| Taiwan | 475<br>22.9 | 515<br>25.0 | 540<br>26.2 |
| Thailand | [illegible] | [illegible]<br>17.5 | [illegible] |
| Other Asia | 1,645<br>79.7 | 1,765<br>84.9 | 1,855<br>89.4 |
| Total Asia | [illegible] | [illegible] | [illegible] |
| Australia | 650<br>29.9 | 675<br>31.1 | 685<br>31.3 |
| New Zealand | [illegible] | [illegible] | [illegible]<br>4.1 |
| **Total Eastern Hemisphere** | 40,385<br>1,946.0 | 41,275<br>1,985.7 | 41,465<br>1,992.9 |
| Total World | [illegible] | [illegible] | [illegible] |
| Of which OECD & LDCs* | 50,250<br>2,394.1 | 51,450<br>2,446.9 | 52,225<br>2,485.4 |

*Organization for Economic Cooperation and Development and lesser developed countries.
Source: British Petroleum

# Worldwide refining capacity

## WESTERN EUROPE

Upper figures = 1,000 b/d
Lower figures = million t/y

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Austria | ...<br>... | 26<br>1.3 | 47<br>2.3 | 94<br>4.7 | 280<br>13.9 | 268<br>13.3 | 273<br>13.6 | 204<br>10.2 | 204<br>10.2 | 204<br>10.2 | 204<br>10.2 | 204<br>10.2 | 204<br>10.2 | 210<br>10.5 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Cyprus | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 16<br>0.8 | 15<br>0.7 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 17<br>0.8 | 18<br>0.9 | 19<br>0.9 | 19<br>0.9 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Finland | ...<br>... | ...<br>... | 25<br>1.2 | 174<br>8.7 | 336<br>16.7 | 299<br>14.9 | 299<br>14.9 | 241<br>12.0 | 241<br>12.0 | 241<br>12.0 | 241<br>12.0 | 241<br>12.0 | 241<br>12.0 | 241<br>12.0 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Germany | 48<br>2.4 | 81<br>4.0 | 573<br>28.5 | 2,359<br>117.5 | 2,986<br>148.7 | 2,386<br>118.8 | 2,172<br>108.2 | 1,933<br>96.3 | 1,720<br>85.7 | 1,648<br>82.1 | 1,518<br>75.6 | 1,507<br>75.0 | 2,065<br>102.8 | 2,062<br>102.7 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Ireland | 11<br>0.5 | ...<br>... | 40<br>2.0 | 55<br>2.7 | 56<br>2.8 | 56<br>2.8 | 56<br>2.8 | 56<br>2.8 | 56<br>2.8 | 56<br>2.8 | 56<br>2.8 | 56<br>2.8 | 56<br>2.8 | 56<br>2.8 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Netherlands | 15<br>0.7 | 77<br>3.8 | 359<br>17.9 | 1,362<br>67.8 | 1,828<br>91.0 | 1,552<br>77.3 | 1,499<br>74.7 | 1,468<br>73.1 | 1,401<br>69.8 | 1,381<br>68.8 | 1,381<br>68.8 | 1,381<br>68.8 | 1,197<br>59.6 | 1,219<br>60.7 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Portugal | 4<br>0.2 | 8<br>0.4 | 23<br>1.1 | 37<br>1.8 | 378<br>18.8 | 282<br>14.0 | 290<br>14.4 | 296<br>14.7 | 294<br>14.6 | 294<br>14.6 | 313<br>15.6 | 313<br>15.6 | 294<br>14.6 | 294<br>14.6 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Sweden | 4<br>0.2 | 26<br>1.3 | 48<br>2.4 | 230<br>11.5 | 458<br>22.8 | 453<br>22.6 | 439<br>21.9 | 429<br>21.4 | 437<br>21.8 | 437<br>21.8 | 427<br>21.3 | 428<br>21.3 | 428<br>21.3 | 435<br>21.7 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Turkey | ...<br>... | 1<br>... | 7<br>0.3 | 149<br>7.4 | 356<br>17.7 | 472<br>23.5 | 460<br>22.9 | 460<br>22.9 | 460<br>22.9 | 676<br>33.7 | 725<br>36.1 | 725<br>36.1 | 729<br>36.3 | 704<br>35.1 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| **Total** | **433**<br>**21.3** | **864**<br>**42.7** | **3,977**<br>**197.8** | **13,912**<br>**692.8** | **20,362**<br>**1,010.9** | **16,705**<br>**832.0** | **16,115**<br>**802.6** | **14,532**<br>**723.9** | **13,831**<br>**688.9** | **14,130**<br>**703.8** | **13,880**<br>**690.3** | **14,234**<br>**708.9** | **14,225**<br>**708.4** | **14,223**<br>**708.3** |

## NORTH AMERICA

Upper figures = 1,000 b/d
Lower figures = million t/y

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Canada | 203<br>10.1 | 329<br>16.4 | 920<br>45.8 | 1,400<br>69.7 | 2,222<br>110.7 | 1,807<br>90.0 | 1,869<br>93.1 | 1,856<br>92.4 | 1,760<br>87.6 | 1,869<br>93.1 | 1,856<br>92.4 | 1,852<br>92.2 | 1,882<br>93.7 | 1,905<br>94.9 |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| **Total** | **4,663**<br>**232.2** | **7,026**<br>**349.9** | **11,170**<br>**556.3** | **14,000**<br>**697.2** | **19,942**<br>**993.2** | **17,737**<br>**883.3** | **17,269**<br>**860.0** | **17,038**<br>**848.5** | **17,018**<br>**847.4** | **17,157**<br>**854.4** | **17,413**<br>**867.1** | **18,096**<br>**901.2** | **17,441**<br>**868.5** | **17,232**<br>**858.2** |

## LATIN AMERICA

Upper figures = 1,000 b/d
Lower figures = million t/y

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Argentina | 103<br>5.1 | 152<br>7.6 | 238<br>11.9 | 457<br>22.8 | 676<br>33.7 | 678<br>33.8 | 678<br>33.8 | 667<br>33.2 | 670<br>33.4 | 690<br>34.4 | 690<br>34.4 | 689<br>34.3 | 696<br>34.7 | 696<br>34.7 |
| Bahamas | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 500<br>24.9 | 500<br>24.9 | 350<br>17.4 | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... |
| Barbados | ...<br>... | ...<br>... | ...<br>... | 3<br>0.1 | 3<br>0.1 | 3<br>0.1 | 3<br>0.1 | 3<br>0.1 | 3<br>0.1 | 3<br>0.1 | 3<br>0.1 | 3<br>0.1 | 3<br>0.1 | 3<br>0.1 |
| Bolivia | 1<br>... | 7<br>0.3 | 12<br>0.6 | 12<br>0.6 | 74<br>3.7 | 47<br>2.3 | 47<br>2.3 | 47<br>2.3 | 47<br>2.3 | 47<br>2.3 | 58<br>2.9 | 58<br>2.9 | 45<br>2.2 | 45<br>2.2 |
| Brazil | 4<br>0.2 | 12<br>0.6 | 156<br>7.8 | 502<br>25.0 | 1,205<br>60.0 | 1,301<br>64.8 | 1,305<br>65.0 | 1,305<br>65.0 | 1,321<br>65.8 | 1,407<br>70.1 | 1,407<br>70.1 | 1,397<br>69.6 | 1,412<br>70.3 | 1,406<br>70.0 |
| Chile | 1<br>... | 4<br>0.2 | 24<br>1.2 | 91<br>4.5 | 139<br>6.9 | 141<br>7.0 | 141<br>7.0 | 141<br>7.0 | 150<br>7.5 | 141<br>7.0 | 147<br>7.3 | 147<br>7.3 | 146<br>7.3 | 143<br>7.1 |
| Colombia | 15<br>0.7 | 24<br>1.2 | 51<br>2.5 | 137<br>6.8 | 193<br>9.6 | 211<br>10.5 | 211<br>10.5 | 211<br>10.5 | 226<br>11.3 | 226<br>11.3 | 227<br>11.3 | 227<br>11.3 | 247<br>12.3 | 274<br>13.6 |
| Costa Rica | ...<br>... | ...<br>... | ...<br>... | 8<br>0.4 | 11<br>0.5 | 17<br>0.8 | 16<br>0.8 | 15<br>0.7 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 15<br>0.7 | 15<br>0.7 |
| Cuba | 4<br>0.2 | 7<br>0.3 | 87<br>4.3 | 93<br>4.6 | 160<br>8.0 | 160<br>8.0 | 160<br>8.0 | 160<br>8.0 | 160<br>8.0 | 160<br>8.0 | 160<br>8.0 | 160<br>8.0 | 280<br>13.9 | 280<br>13.9 |
| Ecuador | 2<br>0.1 | 5<br>0.2 | 7<br>0.3 | 33<br>1.6 | 86<br>4.3 | 84<br>4.2 | 82<br>4.1 | 88<br>4.4 | 88<br>4.4 | 122<br>6.1 | 123<br>6.1 | 145<br>7.2 | 142<br>7.1 | 142<br>7.1 |
| El Salvador | ...<br>... | ...<br>... | ...<br>... | 14<br>0.7 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 17<br>0.8 | 17<br>0.8 | 17<br>0.8 | 17<br>0.8 | 16<br>0.8 | 16<br>0.8 |
| Guatemala | ...<br>... | ...<br>... | ...<br>... | 21<br>1.0 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 |
| Honduras | ...<br>... | ...<br>... | ...<br>... | 10<br>0.5 | 14<br>0.7 | 14<br>0.7 | 14<br>0.7 | 14<br>0.7 | 14<br>0.7 | 14<br>0.7 | 14<br>0.7 | 14<br>0.7 | 14<br>0.7 | 14<br>0.7 |
| Jamaica | ...<br>... | ...<br>... | ...<br>... | 32<br>1.6 | 34<br>1.7 | 36<br>1.8 | 36<br>1.8 | 36<br>1.8 | 36<br>1.8 | 36<br>1.8 | 34<br>1.7 | 34<br>1.7 | 34<br>1.7 | 34<br>1.7 |
| Mexico | 98<br>4.9 | 160<br>8.0 | 357<br>17.8 | 495<br>24.7 | 1,394<br>69.4 | 1,269<br>63.2 | 1,269<br>63.2 | 1,269<br>63.2 | 1,349<br>67.2 | 1,354<br>67.4 | 1,354<br>67.4 | 1,514<br>75.4 | 1,679<br>83.6 | 1,574<br>78.4 |
| Netherlands Antilles | 495<br>24.7 | 617<br>30.7 | 680<br>33.9 | 840<br>41.8 | 792<br>39.4 | 740<br>36.9 | 740<br>36.9 | 320<br>15.9 | 320<br>15.9 | 320<br>15.9 | 320<br>15.9 | 320<br>15.9 | 320<br>15.9 | 470<br>23.4 |
| Nicaragua | ...<br>... | ...<br>... | ...<br>... | 22<br>1.1 | 14<br>0.7 | 15<br>0.7 | 15<br>0.7 | 15<br>0.7 | 15<br>0.7 | 15<br>0.7 | 15<br>0.7 | 15<br>0.7 | 16<br>0.8 | 16<br>0.8 |
| Panama | ...<br>... | ...<br>... | ...<br>... | 75<br>3.7 | 100<br>5.0 | 100<br>5.0 | 100<br>5.0 | 100<br>5.0 | 100<br>5.0 | 100<br>5.0 | 100<br>5.0 | 100<br>5.0 | 100<br>5.0 | 40<br>2.0 |
| Paraguay | ...<br>... | ...<br>... | ...<br>... | 5<br>0.2 | 7<br>0.3 | 8<br>0.4 | 8<br>0.4 | 8<br>0.4 | 8<br>0.4 | 8<br>0.4 | 8<br>0.4 | 8<br>0.4 | 8<br>0.4 | 8<br>0.4 |
| Peru | 22<br>1.1 | 35<br>1.7 | 49<br>2.4 | 92<br>4.6 | 170<br>8.5 | 169<br>8.4 | 176<br>8.8 | 176<br>8.8 | 176<br>8.8 | 182<br>9.1 | 172<br>8.6 | 172<br>8.6 | 189<br>9.4 | 189<br>9.4 |
| Puerto Rico | ...<br>... | ...<br>... | 84<br>4.2 | 155<br>7.7 | 284<br>14.1 | 121<br>6.0 | 121<br>6.0 | 121<br>6.0 | 121<br>6.0 | 123<br>6.1 | 123<br>6.1 | 123<br>6.1 | 125<br>6.2 | 123<br>6.1 |
| Trinidad & Tobago | 49<br>2.4 | 104<br>5.2 | 182<br>9.1 | 430<br>21.4 | 456<br>22.7 | 375<br>18.7 | 320<br>15.9 | 260<br>12.9 | 300<br>14.9 | 300<br>14.9 | 300<br>14.9 | 300<br>14.9 | 246<br>12.3 | 246<br>12.3 |
| Uruguay | 5<br>0.2 | 16<br>0.8 | 28<br>1.4 | 40<br>2.0 | 40<br>2.0 | 45<br>2.2 | 45<br>2.2 | 45<br>2.2 | 45<br>2.2 | 45<br>2.2 | 33<br>1.6 | 33<br>1.6 | 33<br>1.6 | 29<br>1.4 |
| Venezuela | 55<br>2.7 | 254<br>12.6 | 886<br>44.1 | 1,313<br>65.4 | 1,446<br>72.0 | 1,228<br>61.0 | 1,228<br>61.0 | 1,230<br>61.1 | 1,225<br>61.0 | 1,201<br>59.8 | 1,201<br>59.8 | 1,201<br>59.8 | 1,167<br>58.1 | 1,171<br>58.3 |
| Virgin Islands | ...<br>... | ...<br>... | ...<br>... | 220<br>11.0 | 728<br>36.3 | 600<br>29.9 | 545<br>27.1 | 600<br>29.9 | 600<br>29.9 | 545<br>27.1 | 545<br>27.1 | 545<br>27.1 | 545<br>27.1 | 545<br>27.1 |
| Others | ...<br>... | ...<br>... | ...<br>... | 11<br>0.5 | 62<br>3.1 | 55<br>2.7 | 57<br>2.8 | 57<br>2.8 | 67<br>[illegible] | 61<br>3.0 | 60<br>3.0 | 61<br>3.0 | 60<br>3.0 | 60<br>3.0 |
| Total | 854<br>42.3 | 1,397<br>69.4 | 2,841<br>141.5 | 5,114<br>254.5 | 8,620<br>420.2 | 7,949<br>395.6 | 7,695<br>383.1 | 6,930<br>344.4 | 7,090<br>352.5 | 7,148<br>355.6 | 7,143<br>355.3 | 7,315<br>364.0 | 7,594<br>378.0 | 7,588<br>378.0 |

*A section of Sonatrach's refinery and LNG processing facility at Skikda, Algeria. (Photo courtesy OPEC Bulletin.)*

## ASIA-PACIFIC

Upper figures = 1,000 b/d
Lower figures = million t/y

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 4<br>0.2 | 14<br>0.7 | 237<br>11.8 | 594<br>29.6 | 725<br>36.1 | 722<br>36.0 | 697<br>34.7 | 623<br>31.0 | 626<br>31.2 | 637<br>31.7 | 644<br>32.1 | 675<br>33.6 | 706<br>35.2 | 703<br>35.0 |
| Bangladesh | ... | ... | ... | ... | 31<br>1.5 | [illegible] | [illegible] | 31<br>[illegible] | 31<br>[illegible] | [illegible] | [illegible] | [illegible] | 31<br>[illegible] | 31<br>[illegible] |
| Brunei-Malaysia-Singapore | 10<br>0.5 | 10<br>0.5 | 46<br>2.3 | 320<br>15.9 | 1,093<br>54.4 | 1,313<br>65.4 | 1,286<br>64.0 | 1,240<br>61.8 | 1,183<br>58.9 | 1,080<br>53.8 | 1,071<br>53.3 | 1,049<br>52.2 | 1,098<br>54.7 | 1,113<br>55.4 |
| China | ... | 8<br>0.4 | [illegible]<br>4.9 | [illegible]<br>18.9 | [illegible] | 2,050<br>102.1 | 2,150<br>107.1 | 2,150<br>107.1 | 2,200<br>109.6 | 2,200<br>109.6 | 2,200<br>109.6 | 2,200<br>109.6 | 2,200<br>109.6 | 2,200<br>109.6 |
| China, Taiwan | ...<br>... | ...<br>... | 28<br>1.4 | 119<br>5.9 | 425<br>21.2 | 516<br>25.6 | 543<br>27.0 | 543<br>27.0 | 543<br>27.0 | 600<br>29.9 | 570<br>28.4 | 570<br>28.4 | 543<br>27.0 | 543<br>27.0 |
| [illegible]* | ... | ... | ... | ... | 44<br>2.2 | 44<br>2.2 | 44<br>2.2 | ... | ... | ... | ... | ... | ... | ... |
| India | 10<br>0.5 | 6<br>0.3 | 112<br>5.6 | 446<br>22.2 | 557<br>27.7 | 779<br>38.8 | 705<br>35.1 | 867<br>43.2 | 991<br>49.4 | 1,059<br>52.7 | 1,051<br>52.3 | 1,080<br>53.8 | 1,122<br>55.9 | 1,122<br>55.9 |
| Indonesia | [illegible] | [illegible]<br>10.1 | [illegible]<br>13.6 | [illegible]<br>13.2 | [illegible] | [illegible] | 631<br>31.4 | [illegible] | [illegible] | 714<br>35.6 | 714<br>35.6 | 714<br>35.6 | 814<br>40.5 | 860<br>42.8 |
| Japan | 53<br>2.6 | 34<br>1.7 | 640<br>31.9 | 3,140<br>156.4 | 5,509<br>274.3 | 5,020<br>250.0 | 4,813<br>239.7 | 4,613<br>229.7 | 4,790<br>238.5 | 4,567<br>227.4 | 4,363<br>217.3 | 4,198<br>209.1 | 4,383<br>218.3 | 4,612<br>229.7 |
| Korea, North | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 42<br>2.1 | 42<br>2.1 |
| Korea, South | ...<br>... | ...<br>... | ...<br>... | 180<br>9.0 | 601<br>29.9 | 776<br>38.6 | 776<br>38.6 | 782<br>38.9 | 862<br>42.9 | 820<br>40.8 | 880<br>43.8 | 867<br>43.2 | 867<br>43.2 | 1,163<br>57.9 |
| Myanmar (Burma) | ... | ... | [illegible] | 26<br>1.3 | 25<br>1.2 | 26<br>1.3 | 26<br>1.3 | 26<br>1.3 | 26<br>1.3 | 26<br>1.3 | 26<br>1.3 | 32<br>1.6 | 32<br>1.6 | 32<br>1.6 |
| New Zealand | ...<br>... | ...<br>... | ...<br>... | 66<br>3.3 | 74<br>3.7 | 74<br>3.7 | 53<br>2.6 | 53<br>2.6 | 54<br>2.7 | 82<br>4.1 | 88<br>4.4 | 95<br>4.7 | 95<br>4.7 | 95<br>4.7 |
| Okinawa* | ... | ... | ... | ... | [illegible]<br>9.9 | 153<br>7.6 | [illegible]<br>7.6 | 170<br>8.5 | ... | ... | ... | ... | ... | ... |
| Pakistan | ...<br>... | 5<br>0.2 | 6<br>0.3 | 107<br>5.3 | 98<br>4.9 | 126<br>6.3 | 129<br>6.4 | 130<br>6.5 | 130<br>6.5 | 130<br>6.5 | 130<br>6.5 | 121<br>6.0 | 121<br>6.0 | 121<br>6.0 |
| Philippines | ... | ... | 22<br>1.1 | 182<br>9.1 | [illegible]<br>12.4 | 285<br>14.2 | [illegible]<br>14.2 | [illegible] | [illegible] | [illegible] | 254<br>12.6 | [illegible] | 279<br>13.9 | [illegible] |
| Sri Lanka | ...<br>... | ...<br>... | ...<br>... | 44<br>2.2 | 38<br>1.9 | 50<br>2.5 | 50<br>2.5 | 50<br>2.5 | 50<br>2.5 | 50<br>2.5 | 50<br>2.5 | 50<br>2.5 | 50<br>2.5 | 50<br>2.5 |
| Thailand | ... | ... | 1 | [illegible] | [illegible] | 176<br>[illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 221<br>11.0 | 221<br>11.0 |
| Others | 27<br>1.3 | 4<br>0.2 | ...<br>... | 12<br>0.6 | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... |
| Total | [illegible] | [illegible]<br>14.1 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

*Prior to 1980, included in others.

[illegible]

## AFRICA

Upper figures = 1,000 b/d
Lower figures = million t/y

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Algeria | ...<br>... | ...<br>... | ...<br>... | 48<br>2.4 | 122<br>6.1 | 137<br>6.8 | 464<br>23.1 | 465<br>23.2 | 465<br>23.2 | 465<br>23.2 | 465<br>23.2 | 465<br>23.2 | 465<br>23.2 | 465<br>23.2 |
| Angola-Cabinda | ...<br>... | ...<br>... | 2<br>0.1 | 16<br>0.8 | 30<br>1.5 | 32<br>1.6 | 32<br>1.6 | 32<br>1.6 | 32<br>1.6 | 32<br>1.6 | 32<br>1.6 | 32<br>1.6 | 32<br>1.6 | 32<br>1.6 |
| Cameroon | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 41<br>2.0 | 43<br>2.1 | 43<br>2.1 | 43<br>2.1 | 43<br>2.1 | 42<br>2.1 | 43<br>2.1 | 42<br>2.1 | 42<br>2.1 |
| Congo | ...<br>... | ...<br>... | ...<br>... | 14<br>0.7 | ...<br>... | 21<br>1.0 | 21<br>1.0 | 21<br>1.0 | 21<br>1.0 | 21<br>1.0 | 21<br>1.0 | 21<br>1.0 | 21<br>1.0 | 21<br>1.0 |
| Egypt | 17<br>0.8 | 39<br>1.9 | 87<br>4.3 | 175<br>8.7 | 234<br>11.7 | 369<br>18.4 | 369<br>18.4 | 434<br>21.6 | 452<br>22.5 | 452<br>22.5 | 489<br>24.4 | 489<br>24.4 | 523<br>26.0 | 523<br>26.0 |
| Ethiopia | ...<br>... | ...<br>... | ...<br>... | 15<br>0.8 | 14<br>0.7 | 15<br>0.7 | 14<br>0.7 | 18<br>0.9 | 18<br>0.9 | 18<br>0.9 | 18<br>0.9 | 18<br>0.9 | 18<br>0.9 | 18<br>0.9 |
| Gabon | ...<br>.. | ...<br>... | ...<br>... | 13<br>0.6 | 20<br>1.0 | 20<br>1.0 | 20<br>1.0 | 23<br>1.1 | 16<br>0.8 | 23<br>1.1 | 24<br>1.2 | 24<br>1.2 | 24<br>1.2 | 24<br>1.2 |
| Ghana | ...<br>... | ...<br>... | ...<br>... | 28<br>1.4 | 25<br>1.3 | 28<br>1.4 | 28<br>1.4 | 28<br>1.4 | 28<br>1.4 | 28<br>1.4 | 27<br>1.3 | 27<br>1.3 | 27<br>1.3 | 27<br>1.3 |
| Ivory Coast | ...<br>... | ...<br>... | ...<br>... | 19<br>0.9 | 50<br>2.5 | 90<br>4.5 | 90<br>4.5 | 90<br>4.5 | 73<br>3.6 | 60<br>3.0 | 60<br>3.0 | 69<br>3.4 | 69<br>3.4 | 69<br>3.4 |
| Kenya | ...<br>... | ...<br>... | ...<br>... | 44<br>2.2 | 95<br>4.7 | 79<br>3.9 | 95<br>4.7 | 95<br>4.7 | 95<br>4.7 | 90<br>4.5 | 90<br>4.5 | 95<br>4.7 | 90<br>4.5 | 90<br>4.5 |
| Liberia | ...<br>... | ...<br>... | ...<br>... | 10<br>0.5 | 15<br>0.7 | 15<br>0.7 | 15<br>0.7 | 15<br>0.7 | 15<br>0.7 | 15<br>0.7 | 15<br>0.7 | 15<br>0.7 | 15<br>0.7 | 15<br>0.7 |
| Libya | ...<br>... | ...<br>... | ...<br>... | 10<br>0.5 | 120<br>6.0 | 125<br>6.2 | 330<br>16.4 | 330<br>16.4 | 329<br>16.4 | 329<br>16.4 | 329<br>16.4 | 329<br>16.4 | 348<br>17.3 | 348<br>17.3 |
| Madagascar | ...<br>... | ...<br>... | ...<br>... | 13<br>0.6 | 11<br>0.5 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 | 16<br>0.8 |
| Morocco | ...<br>... | ...<br>... | 2<br>0.1 | 35<br>1.7 | 72<br>3.6 | 74<br>3.7 | 80<br>4.0 | 81<br>4.0 | 81<br>4.0 | 155<br>7.7 | 155<br>7.7 | 155<br>7.7 | 155<br>7.7 | 155<br>7.7 |
| Mozambique | ...<br>... | ...<br>... | ...<br>... | 20<br>1.0 | 16<br>0.8 | 17<br>0.8 | 17<br>0.8 | 17<br>0.8 | 17<br>0.8 | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... |
| Nigeria | ...<br>... | ...<br>... | ...<br>... | 46<br>2.3 | 160<br>8.0 | 247<br>12.3 | 250<br>12.4 | 250<br>12.4 | 250<br>12.4 | 270<br>13.4 | 415<br>20.7 | 433<br>21.6 | 433<br>21.6 | 433<br>21.6 |
| Senegal | ...<br>... | ...<br>... | ...<br>... | 13<br>0.6 | 20<br>1.0 | 18<br>0.9 | 30<br>1.5 | 30<br>1.5 | 30<br>1.5 | 30<br>1.5 | 30<br>1.5 | 24<br>1.2 | 24<br>1.2 | 24<br>1.2 |
| Sierra Leone | ...<br>... | ...<br>... | ...<br>... | 10<br>0.5 | 10<br>0.5 | 10<br>0.5 | 10<br>0.5 | 10<br>0.5 | 10<br>0.5 | 10<br>0.5 | 10<br>0.5 | 10<br>0.5 | 10<br>0.5 | 10<br>0.5 |
| South Africa | 1<br>... | ...<br>... | 25<br>1.2 | 184<br>9.2 | 478<br>23.8 | 389<br>19.4 | 389<br>19.4 | 389<br>19.4 | 389<br>19.4 | 434<br>21.6 | 434<br>21.6 | 434<br>21.6 | 431<br>21.5 | 431<br>21.5 |
| Sudan | ...<br>... | ...<br>... | ...<br>... | 21<br>1.0 | 25<br>1.3 | 24<br>1.2 | 24<br>1.2 | 24<br>1.2 | 24<br>1.2 | 21<br>1.0 | 21<br>1.0 | 25<br>1.2 | 22<br>1.1 | 22<br>1.1 |
| Tanzania | ...<br>... | ...<br>... | ...<br>... | 14<br>0.7 | 17<br>0.8 | 17<br>0.8 | 14<br>0.7 | 14<br>0.7 | 14<br>0.7 | 14<br>0.7 | 14<br>0.7 | 14<br>0.7 | 17<br>0.8 | 17<br>0.8 |
| Togo | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 20<br>1.0 | 20<br>1.0 | 20<br>1.0 | 20<br>1.0 | 20<br>1.0 | 20<br>1.0 | ...<br>... | ...<br>... | ...<br>... | ...<br>... |
| Tunisia | ...<br>... | ...<br>... | ...<br>... | 23<br>1.1 | 34<br>1.7 | 34<br>1.7 | 34<br>1.7 | 34<br>1.7 | 34<br>1.7 | 34<br>1.7 | 34<br>1.7 | 34<br>1.7 | 34<br>1.7 | 34<br>1.7 |
| Zaire | ...<br>... | ...<br>... | ...<br>... | 21<br>1.0 | 16<br>0.8 | 17<br>0.8 | 17<br>0.8 | 17<br>0.8 | 17<br>0.8 | 17<br>0.8 | 17<br>0.8 | 17<br>0.8 | 17<br>0.8 | 17<br>0.8 |
| Others | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 35<br>1.7 | 35<br>1.7 | 36<br>1.7 | 35<br>1.7 | 35<br>1.7 | 34<br>1.7 | 31<br>1.5 | 35<br>1.7 | 35<br>1.7 | 34<br>1.7 |
| Total | [illegible]<br>[illegible] | [illegible]<br>[illegible] | [illegible]<br>[illegible] | [illegible]<br>[illegible] | [illegible]<br>[illegible] | [illegible]<br>[illegible] | [illegible]<br>122.1 | [illegible]<br>125.7 | [illegible]<br>125.4 | [illegible]<br>128.6 | [illegible]<br>136.5 | [illegible]<br>140.4 | [illegible]<br>142.8 | [illegible]<br>142.8 |

## MIDDLE EAST

Upper figures = 1,000 b/d
Lower figures = million t/y

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Abu Dhabi | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 14<br>0.7 | 185<br>9.2 | 185<br>9.2 | 185<br>9.2 | 185<br>9.2 | 180<br>9.0 | 180<br>9.0 | 180<br>9.0 | 193<br>9.6 | 193<br>9.6 |
| Bahrain | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Iran | 333<br>16.6 | 502<br>25.0 | 495<br>24.7 | 645<br>32.1 | 921<br>45.9 | 530<br>26.4 | 530<br>26.4 | 530<br>26.4 | 530<br>26.4 | 530<br>26.4 | 530<br>26.4 | 530<br>26.4 | 720<br>35.9 | 720<br>35.9 |
| Iraq | 4<br>[illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 319<br>[illegible] | 319<br>[illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Israel | ...<br>... | 83<br>4.1 | 87<br>4.3 | 107<br>5.3 | 195<br>9.7 | 190<br>9.5 | 170<br>8.5 | 170<br>8.5 | 180<br>9.0 | 180<br>9.0 | 180<br>9.0 | 180<br>9.0 | 180<br>9.0 | 208<br>10.4 |
| Jordan | ... | ... | ... | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Kuwait* | ...<br>... | 25<br>1.2 | 270<br>13.5 | 569<br>28.4 | 645<br>32.1 | 623<br>31.0 | 669<br>33.3 | 634<br>31.6 | 618<br>30.8 | 628<br>31.3 | 817<br>40.7 | 819<br>40.8 | 819<br>40.8 | 819<br>40.8 |
| Lebanon | ... | 6<br>0.3 | [illegible] | [illegible] | [illegible] | [illegible] | 17<br>0.8 | 17<br>0.8 | [illegible] | [illegible] | [illegible] | [illegible] | 38<br>1.9 | 38<br>1.9 |
| Qatar | ...<br>... | ...<br>... | 1<br>... | 1<br>... | 11<br>0.5 | 63<br>3.1 | 56<br>2.8 | 56<br>2.8 | 62<br>3.1 | 62<br>3.1 | 62<br>3.1 | 62<br>3.1 | 62<br>3.1 | 60<br>3.0 |
| Saudi Arabia* | ... | 140<br>7.0 | [illegible] | 377<br>18.8 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 1,375<br>[illegible] | 1,375<br>[illegible] | [illegible] | [illegible] | [illegible] |
| Syria | ...<br>... | ...<br>... | ...<br>... | 59<br>2.9 | 223<br>11.1 | 229<br>11.4 | 228<br>11.4 | 229<br>11.4 | 229<br>11.4 | 229<br>11.4 | 244<br>12.2 | 244<br>12.2 | 237<br>11.8 | 237<br>11.8 |
| Yemen | ... | ... | 120<br>6.0 | 178<br>8.9 | 175<br>8.7 | 130<br>6.5 | 178<br>8.9 | 162<br>8.1 | 170<br>8.5 | 170<br>8.5 | 162<br>8.1 | 162<br>8.1 | 172<br>8.6 | 115<br>5.7 |
| Others | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 48<br>2.4 | 50<br>2.5 | 48<br>2.4 | 58<br>2.9 | 87<br>4.3 | 87<br>4.3 | 87<br>4.3 | 76<br>3.8 | 80<br>4.0 |
| Total | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Total, excl. U.S.S.R., E. Europe | 6,612<br>328.6 | 10,524<br>523.5 | 21,005<br>1,046.9 | 41,960<br>2,089.5 | 65,678<br>3,270.5 | 60,225<br>2,999.9 | 59,673<br>2,971.2 | 57,066<br>2,843.2 | 57,016<br>2,838.1 | 57,680<br>2,872.7 | 57,894<br>2,878.5 | 59,067<br>2,942.7 | 59,720<br>2,973.6 | 60,067<br>2,991.6 |

*Includes Neutral Zone.

## U.S.S.R.-EASTERN EUROPE

Upper figures = 1,000 b/d
Lower figures = million t/y

| | 1940 | 1950 | 1960 | 1970 | 1980 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Albania* | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 40<br>2.0 | 40<br>2.0 |
| Bulgaria* | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | ...<br>... | 300<br>14.9 | 300<br>14.9 |
| Czechoslovakia | ...<br>... | 16<br>0.8 | 46<br>2.3 | 220<br>11.0 | 455<br>22.7 | 455<br>22.7 | 455<br>22.7 | 455<br>22.7 | 455<br>22.7 | 455<br>22.7 | 455<br>22.7 | 455<br>22.7 | 455<br>22.7 | 455<br>22.7 |
| Hungary | ...<br>... | 20<br>1.0 | 58<br>2.9 | 130<br>6.5 | 290<br>14.4 | 312<br>15.5 | 242<br>12.1 | 242<br>12.1 | 242<br>12.1 | 220<br>11.0 | 220<br>11.0 | 220<br>11.0 | 220<br>11.0 | 220<br>11.0 |
| Poland | ...<br>... | 4<br>0.2 | 20<br>1.0 | 156<br>7.8 | 385<br>19.2 | 385<br>19.2 | 385<br>19.2 | 385<br>19.2 | 385<br>19.2 | 385<br>19.2 | 385<br>19.2 | 385<br>19.2 | 385<br>19.2 | 333<br>16.6 |
| Romania | ...<br>... | 182<br>9.1 | 260<br>12.9 | 356<br>17.7 | 608<br>30.3 | 617<br>30.7 | 617<br>30.7 | 617<br>30.7 | 617<br>30.7 | 617<br>30.7 | 617<br>30.7 | 617<br>30.7 | 617<br>30.7 | 657<br>32.7 |
| U.S.S.R. | ...<br>... | 900<br>44.8 | 2,800<br>139.4 | 5,640<br>280.9 | 10,950<br>545.3 | 12,000<br>597.6 | 12,200<br>607.6 | 12,260<br>610.5 | 12,260<br>610.5 | 12,260<br>610.5 | 12,300<br>612.5 | 12,300<br>612.5 | 12,300<br>612.5 | 12,300<br>612.0 |
| Yugoslavia | 5<br>0.2 | 8<br>0.4 | 10<br>0.5 | 170<br>8.5 | [illegible]<br>14.7 | 297<br>14.8 | 297<br>14.8 | [illegible]<br>15.0 | [illegible]<br>24.1 | [illegible]<br>30.2 | [illegible]<br>30.2 | [illegible] | [illegible]<br>30.3 | [illegible]<br>30.5 |
| Others | ...<br>... | 4<br>0.2 | 40<br>2.0 | 332<br>16.5 | 852<br>42.4 | 894<br>44.5 | 894<br>44.5 | 894<br>44.5 | 894<br>44.5 | 852<br>42.4 | 910<br>45.3 | 852<br>42.4 | ...<br>... | ...<br>... |
| Total | 5<br>0.2 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| World Total | 6,617<br>328.8 | 11,888<br>590.8 | 24,239<br>1,206.9 | 48,862<br>2,436.8 | 79,514<br>3,958.5 | 75,199<br>3,743.6 | 74,783<br>3,722.8 | 72,283<br>3,597.9 | 72,382<br>3,602.6 | 73,065<br>3,636.5 | 73,369<br>3,650.2 | 74,535<br>3,711.5 | 74,645<br>3,717.1 | 74,881<br>3,733.7 |

*Prior to 1991, included in others.

# WORLDWIDE GAS PROCESSING

## *Capacities as of January 1, 1991, and average production*

| Country | No. plants | MMcfd<br>Gas capacity | MMcfd<br>Gas through-put | Production 1,000 gpd (Average based on the past 12 months)<br>Ethane | Prop. | Isobut. | Process or unsplit butane | LP-gas mix | Raw NGL mix | Debut. nat. gaso. | Other | Total products |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **United States** | | | | | | | | | | | | |
| Alabama | 7 | 255.0 | 204.6 | .... | 158.5 | .... | 134.8 | 6.4 | 38.3 | 117.1 | 504.0 | 959.1 |
| Alaska | 4 | 5,773.5 | 5,701.0 | .... | 2.6 | .... | 16.5 | .... | 2,720.1 | .... | .... | 2,739.2 |
| Arkansas | 5 | 938.0 | 581.2 | 0.5 | 7.4 | 1.7 | 7.1 | .... | 39.5 | 16.1 | 3.3 | 75.6 |
| California | 32 | 1,090.7 | 666.6 | .... | 402.7 | 65.3 | 190.0 | 70.7 | 303.5 | 100.4 | 11.4 | 1,144.0 |
| Colorado | 43 | 1,095.5 | 692.6 | 62.5 | 239.4 | 15.4 | 83.2 | 54.9 | 702.6 | 53.1 | 16.1 | 1,227.2 |
| Florida | 2 | 890.0 | 749.8 | 51.0 | 103.7 | 22.0 | 67.3 | .... | .... | 66.3 | .... | 310.3 |
| Kansas | 23 | 5,191.0 | 3,627.4 | 360.2 | 929.7 | 95.5 | 383.5 | .... | 840.4 | 286.0 | 1.9 | 2,897.2 |
| Kentucky | 2 | 71.0 | 69.8 | .... | .... | .... | .... | .... | 163.3 | .... | .... | 163.3 |
| Louisiana | 75 | 18,666.0 | 11,367.0 | 1,457.6 | 1,249.5 | 426.5 | 434.1 | 35.5 | 5,392.8 | 699.5 | 136.9 | 9,832.4 |
| Michigan | 28 | 4,757.3 | 1,422.1 | .... | 67.7 | .... | .... | 6.3 | 559.5 | 12.7 | 18.6 | 664.8 |
| Mississippi | 6 | 898.2 | 267.0 | .... | 10.8 | .... | 8.1 | .... | 11.0 | 7.9 | 3.2 | 41.0 |
| Montana | 7 | 28.0 | 10.3 | .... | 29.7 | .... | 8.6 | 7.4 | 7.9 | 8.1 | 1.4 | 63.1 |
| New Mexico | 28 | 2,655.5 | 1,782.4 | 176.0 | 238.2 | 13.5 | 43.9 | .... | 4,802.1 | 60.3 | 15.8 | 5,349.8 |
| North Dakota | 8 | 128.0 | 83.1 | .... | 169.4 | .... | 90.8 | 9.8 | 98.9 | 25.1 | 5.2 | 399.2 |
| Ohio | 1 | 20.0 | 8.5 | .... | .... | .... | .... | .... | 6.4 | .... | .... | 6.4 |
| Oklahoma | 101 | 4,678.0 | 2,827.7 | 820.2 | 813.6 | 109.6 | 286.3 | 119.3 | 5,121.5 | 326.2 | 216.9 | 7,813.6 |
| Pennsylvania | 2 | 14.0 | 8.3 | .... | 4.7 | .... | 3.0 | .... | .... | 4.1 | .... | 11.8 |
| Texas | 301 | 16,470.1 | 10,492.7 | 3,069.6 | 3,197.9 | 520.1 | 1,434.9 | 601.6 | 15,985.3 | 1,824.8 | 1,389.5 | 28,023.7 |
| Utah | 12 | 522.5 | 292.3 | .... | 92.0 | .... | 30.7 | .... | 136.6 | 37.1 | 10.0 | 306.4 |
| West Virginia | 7 | 397.5 | 300.9 | 204.4 | 125.6 | 20.3 | 38.7 | 88.2 | 268.6 | .... | .... | 745.8 |
| Wyoming | 40 | 3,660.3 | 2,843.4 | 21.9 | 283.4 | 9.6 | 216.1 | 84.3 | 2,516.5 | 146.5 | 1,145.4 | 4,423.7 |
| **Total U.S.** | **734** | **68,200.1** | **43,998.7** | **6,223.9** | **8,126.5** | **1,299.5** | **3,477.6** | **1,084.4** | **39,714.8** | **3,791.3** | **3,479.6** | **67,197.6** |
| Abu Dhabi | 6 | 1,719.0 | 1,269.0 | .... | .... | .... | .... | .... | .... | 546.0 | .... | 546.0 |
| Algeria | 4 | 5,335.2 | 4,268.2 | .... | .... | .... | .... | 632.8 | .... | .... | 5,449.2 | 6,082.0 |
| Argentina | 14 | 1,488.4 | 1,498.9 | 687.7 | 497.2 | .... | 334.8 | .... | .... | 319.8 | 0.8 | 1,840.3 |
| Australia | 5 | 2,333.0 | 1,376.0 | 279.0 | 441.0 | .... | 249.0 | 610.3 | .... | 1,058.5 | 850.0 | 3,487.8 |
| Austria | 1 | 17.5 | 13.7 | .... | .... | .... | .... | 26.7 | .... | 28.4 | .... | 55.1 |
| Bahrain | 1 | 168.0 | 155.0 | .... | .... | .... | .... | 25.6 | .... | .... | .... | 25.6 |
| Bangladesh | 2 | 240.0 | 178.0 | .... | .... | .... | .... | .... | .... | .... | 8.2 | 8.2 |
| Bolivia | 2 | 474.0 | 177.3 | .... | 1.4 | 2.5 | .... | 161.7 | .... | 61.5 | 136.9 | 364.0 |
| Brazil | 11 | 452.3 | 456.2 | 8.0 | .... | .... | .... | 313.0 | .... | 118.4 | 228.7 | 668.1 |
| Brunei | 2 | 1,132.0 | 867.4 | .... | 7.9 | .... | .... | .... | .... | 265.0 | .... | 272.9 |
| Canada | | | | | | | | | | | | |
| Alberta | 493 | 23,462.0 | 14,668.5 | 6,499.2 | 3,263.2 | 1,043.6 | 704.8 | 1,608.2 | 4,034.3 | 3,939.6 | 541.7 | 21,634.6 |
| British Columbia | 16 | 2,408.3 | 1,195.7 | .... | 149.1 | .... | 59.1 | 3.5 | .... | 22.2 | .... | 233.9 |
| Northwest Territories | 2 | 219.9 | 28.3 | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Saskatchewan | 29 | 354.1 | 249.5 | .... | 11.9 | .... | 6.6 | 12.9 | 104.2 | 4.4 | 18.0 | 158.0 |
| Chile | 2 | 470.0 | 423.0 | .... | 190.0 | .... | 120.0 | .... | .... | 106.0 | .... | 416.0 |
| China, Taiwan | 4 | 271.0 | 110.2 | 9.4 | 22.0 | .... | 15.8 | .... | 7.0 | 11.4 | .... | 65.6 |
| Colombia | 7 | 366.4 | 212.3 | 110.0 | 51.3 | .... | 54.9 | 46.3 | .... | 63.7 | 1.0 | 327.2 |
| Denmark | 1 | 450.0 | 240.0 | .... | .... | .... | .... | .... | .... | .... | 100.0 | 100.0 |
| Dubai | 1 | 330.0 | 330.0 | .... | .... | .... | .... | .... | .... | .... | 650.5 | 650.5 |
| Ecuador | 2 | 41.0 | 20.5 | .... | .... | .... | .... | 97.1 | .... | 37.3 | .... | 134.4 |
| Egypt | 8 | 1,323.0 | 1,236.0 | .... | .... | .... | .... | 715.0 | .... | .... | 1,215.4 | 1,930.4 |
| France | 1 | 570.0 | 563.0 | .... | 139.0 | .... | 132.0 | .... | .... | 270.0 | .... | 541.0 |
| Germany | 3 | 366.0 | 274.0 | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Greece | 2 | 40.0 | 29.7 | .... | .... | .... | .... | .... | 110.3 | .... | .... | 110.3 |
| Hungary | 12 | 1,097.2 | 475.3 | .... | 65.7 | 6.3 | 70.0 | .... | 367.4 | 819.2 | 103.6 | 1,432.2 |
| Indonesia | 10 | 3,905.0 | 3,498.2 | 17.3 | 329.0 | 113.4 | 0.9 | 51.6 | 1,277.2 | .... | 32.6 | 1,822.0 |
| Italy | 17 | 7,614.0 | 1,587.0 | .... | .... | .... | .... | 2.7 | 8.0 | 7.5 | .... | 18.2 |
| Kuwait | 3 | 1,815.0 | 1,452.0 | .... | 1,722.0 | .... | 980.0 | .... | .... | 811.8 | .... | 3,513.8 |
| Libya | 7 | 1,851.0 | 1,227.0 | .... | .... | .... | .... | 37.8 | 5,577.0 | .... | 551.0 | 6,165.8 |
| Malaysia | 2 | 282.0 | 105.0 | 161.4 | 23.2 | 136.3 | 28.2 | .... | .... | 154.1 | .... | 503.2 |
| Mexico | 11 | 4,649.0 | 3,561.1 | 15,174.0 | .... | .... | .... | .... | .... | .... | 15.2 | 15,189.2 |
| Netherlands | 1 | 440.0 | 145.0 | .... | .... | .... | .... | .... | .... | .... | 6.1 | 6.1 |
| New Zealand | 6 | 1,444.0 | 626.0 | .... | 39.1 | .... | 1.8 | 134.7 | .... | 18.6 | 733.7 | 927.9 |
| Norway | 2 | 950.0 | 537.0 | .... | 682.0 | 106.0 | 256.0 | .... | 292.0 | 193.0 | .... | 1,531.0 |
| Oman | 8 | 626.0 | 309.4 | .... | .... | .... | .... | .... | 202.0 | 43.0 | .... | 245.0 |
| Pakistan | 6 | 1,275.0 | 978.7 | .... | .... | .... | .... | 53.8 | 64.9 | .... | 9.1 | 127.8 |
| Peru | 2 | 70.0 | 37.0 | .... | 3.4 | .... | 1.0 | 5.6 | 28.9 | .... | 4.0 | 42.9 |
| Qatar | 2 | 579.0 | 291.0 | .... | 506.0 | 288.0 | .... | .... | .... | 199.0 | .... | 993.0 |
| Saudi Arabia | 5 | 4,300.0 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Sharjah, U.A.E. | 2 | 940.0 | 768.0 | .... | 287.0 | .... | 206.0 | .... | .... | .... | 1,164.0 | 1,657.0 |
| Spain | 3 | 428.0 | 177.0 | .... | .... | .... | .... | .... | .... | .... | 73.0 | 73.0 |
| Thailand | 2 | 850.0 | 550.0 | .... | .... | .... | .... | 400.4 | 8.4 | 84.0 | .... | 492.8 |
| United Kingdom | 10 | 7,910.0 | 979.2 | .... | 332.0 | .... | 291.0 | .... | | 1,748.5 | 49.1 | 2,420.6 |
| Venezuela | 14 | 2,913.0 | 2,557.0 | 213.3 | 197.4 | .... | 113.4 | 231.3 | 3,274.6 | 171.9 | .... | 4,201.9 |
| Yemen | 1 | 400.0 | 443.0 | .... | .... | .... | .... | 53.6 | 305.5 | .... | .... | 359.1 |
| **Total, outside U.S.** | **745** | **88,369.3** | **50,144.3** | **23,159.3** | **8,960.8** | **1,696.1** | **3,625.3** | **5,224.6** | **15,661.7** | **11,102.8** | **11,941.8** | **81,374.4** |
| **World Total** | **1,479** | **156,569.4** | **94,143.0** | **29,383.2** | **17,087.3** | **2,997.6** | **7,102.9** | **6,309.0** | **55,376.5** | **14,894.1** | **15,421.4** | **148,572.0** |